



# Highway Safety Literature

## An Announcement of Recent Acquisitions . . .

71-1  
HSL No. 71-15 MAY 7, 1971

HS-008 855 - HS-008 932 , HS-800 431 - HS-800 458

HSL No. ~~71-15~~  
May 7, 1971



### THIS ISSUE CONTAINS:

HS-008 855 - HS-008 932  
HS-800 431 - HS-008 458

Washington, D. C. 20591

**INTRODUCTION**

Publications announced in *Highway Safety Literature* include the most recent additions to the collection of the NHTSA Scientific & Technical Information Service. Subject areas covered include all phases of highway, motor vehicle, and traffic safety, especially those encompassed by the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966.

Individual issues of *HSL* are numbered according to the year and the issue number within that year; thus, 71 designates the year and 1, 2, 3, etc., the individual issues. To aid the user in location citations by the HS-number, the cover bears the inclusive entry numbers for each issue.

Entries in *HSL* are arranged according to the revised NHTSA Subject Category List shown in the Table of Contents. The List is a two-level arrangement consisting of five major subject fields subdivided into 58 subject groups. Documents related directly to the National Highway Traffic Safety

Administration (NHTSA) are announced in a separate section headed **NHTSA DOCUMENTS** and are numbered in five distinct series: NHTSA Accident Investigation Reports (HS-600 000 series), NHTSA Compliance Test Reports (HS-610 000 series), NHTSA Contractors Reports (HS-800 000 series), NHTSA Staff Speeches, Papers, etc. (HS-810 000 series), and NHTSA Imprints (HS-820 000 series). For NHTSA DOCUMENTS in series HS-600 000 and HS-610 000, individual full case reports are available for inspection at the National Highway Traffic Safety Administration; or for purchase from NTIS (see page ii). Although announced together in a separate section, these documents are also assigned specific subject categories for machine retrieval.

A document which contains a number of separate articles is announced as a complete volume in the subject category most applicable to it as a whole. Entries for the individual articles appear in their most specific subject category

**SAMPLE ENTRIES**

Subject Category Array

NHSB Accession no..... HS-800 218 Fld. 5/21; 5/9

Title of document..... AN INVESTIGATION OF USED CAR  
SAFETY STANDARDS-SAFETY  
INDEX: FINAL REPORT. VOL. 6 -  
APPENDICES G-LPersonal author(s)..... by E. N. Wells; J. P. Fitzmaurice; C. E.  
Guilliams; S. R. Kalin; P. D. WilliamsCorporate author ..... Operations Research, Inc., Silver  
Spring, Md., Ø15ØØØ ← For computer use only

Collation \_\_\_\_\_

Publication date..... 12 Sep 1969 150p  
Contract FH-11-6921  
Report no. ORI-TR-553-Vol-6; PB-190  
523Abstract..... Appendices G-L to this study of used  
car safety standards include: indenture  
model diagrams for classes I-IV motor  
trucks; degradation, wear, and failure  
data for motor truck classes I-IV; and  
safety index tables for classes I-IV  
motor trucks.

Search terms: Wear /Trucks;  
Failures /Trucks: Used cars; Inspec-  
tion standards /Trucks; Inspection  
standards /Data

AVAILABILITY: NTIS

HS-004 497 Fld. 5/19

AUTO THEFT--THE PROBLEM  
AND THE CHALLENGE

by Thomas A. Williams, Sr.

Journal citation . . . Published in *FBI Law Enforce-  
ment Bulletin* v37 n12 p15-7 (Dec 1968)

Gives figures on the extent of the  
auto theft problem and comments on  
antitheft devices available now or in  
the planning stage.

Search terms: Theft, Theft protec-  
tion, Stolen cars

## TABLE OF CONTENTS

**NOTE:** ( ) Numbers in parentheses following certain subject groups indicate the Highway Safety Program Standards (No. 1, and up) and/or Federal Motor Vehicle Safety Standards (No. 101 and up) which may apply to these groups.

### **INTRODUCTION AND SAMPLE ENTRIES . . . . . Inside Front Cover**

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/2 Injuries	/2 Community Support (17)
/3 Investigation and Records (10, 14-15)	/3 Cost Effectiveness
/4 Locations (9, 14)	/4 Governmental Aspects
<b>2/0 HIGHWAY SAFETY . . . . . 4</b>	/5 Information Technology
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/6 Maintenance (12)	
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/8 Police Traffic Services (15)	<b>5/0 VEHICLE SAFETY . . . . . 11</b>
/9 Traffic Control (13-14)	* All Federal Motor Vehicle Safety Standards apply to passenger vehicles. An asterisk before a subject group indicates additional types of vehicles to which the indicated standards may apply.
/10 Traffic Courts (7)	/1 Brake Systems (102, 105-6, 116)
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/5 Driver Education (4, 14)	/8 Hood Latch Systems (113)
/6 Driver Licensing (5; 10, 14)	/9 Inspection (1)
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/9 Impaired Drivers	/12 Manufacturers, Distributors, and Dealers
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/11 Pedestrians (14-15)	/14 Occupant Protection (15; 201-4, 207-10)
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	*/20 Trucks and Trailers (102-4, 107-8, 112-3, 116, 205-6, 209)
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**NOTE:** Material published in Highway Safety Literature (HSL) is intended for the information and assistance of the motor vehicle and highway safety community. While brands names, equipment model names and identification, and companies may be mentioned from time to time, this data is included as an information service. Inclusion of this information in the HSL should not, under any circumstances, be construed as an endorsement or an approval by the U.S. Department of Transportation, National Highway Traffic Safety Administration of any particular product, course, or equipment.

Harry A. Feinberg  
Managing Editor

## AVAILABILITY OF DOCUMENTS AND INSTRUCTIONS FOR ORDERING

Department of Transportation personnel may borrow copies of publications directly from the NHTSA. Outside the Washington, D.C. area, phone (202) 426-2768. In Washington, D.C. area, use government ID, phone 118-62768. Non-DOT personnel should contact their company or agency libraries for assistance.

Journals cited may be obtained through most research libraries.

Contractors' reports and other documents can usually be obtained as indicated under AVAILABILITY. However, there is no certainty that retention copies will be available for more than a limited period after a document is issued.

The more common distribution sources are identified by symbols which are explained below:

**NTIS:** National Technical Information Service (formerly Clearinghouse for Federal Scientific and Technical Information—CFSTI), Springfield, Va. 22151. Order by accession number: HS, AD, or PB. Prepayment is required by NTIS (CFSTI) coupon (GPO coupons are not acceptable), check, or money order (made payable to the NTIS). HC (Paper copy; full size original or reduced

facsimile) \$3.00 up; MF (microfiche approximately 4x6" negative sheet film; reader required) \$0.95.

**GPO:** Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Give corporate author, title, personal author, and report number. Prepayment is required by GPO coupon (NTIS [CFSTI] coupons are not acceptable), check or money order (made payable to the Superintendent of Documents).

**HRB:** Highway Research Board, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington, D. C. 20418.

**NHTSA:** National Highway Traffic Safety Administration General Services Division, Washington, D.C. 20591 (Telephone (202) 426-0874).

**SAE:** Society of Automotive Engineers, Dept. IISL, 2 Pennsylvania Plaza, New York, N.Y. 10001. Order by SAE report number. Prices given are list; discounts are available to members and sometimes to libraries and U.S. Government Agencies. Prepayment is required; orders without payment are subject to a \$1 handling charge.

### IMPORTANT

**WHEN REQUESTING** a document, to be absolutely sure you receive what you order, give the accession number (HS, PB, AD number) or report number (in cases such as an SAE document), title of report, and the personal or corporate author (whichever is cited). When requesting an HS-numbered document from NTIS (CFSTI), add DOT/ to the prefix HS; example HS-800 000 should be ordered as DOT/HS-800 000.

**1/0 ACCIDENTS****1/1 Emergency Services****HS-008 855 Fld. 1/1****IS THE HELICOPTER THE ANSWER?**

by James Kiely

Published in *Traffic Safety* v70 n10 p8-10, 40 (Oct 1970)

Successful use of helicopters for evacuating wounded in Vietnam has aroused widespread interest in their use as civilian rescue vehicles. They have been tested in various localities, and their proper role in highway emergencies is now becoming clearer. Their use in Chicago, chiefly as ambulances, is described.

**Search terms:** Helicopter ambulances /Emergency medical services; Helicopter ambulances /Chicago; Emergency services /Helicopters

between arrival at the hospital and death should have been adequate to initiate resuscitation, diagnostic measures, and definitive treatment. In the opinion of the reviewers, 17 of these lives might possibly have been saved by prompt and proper diagnosis and treatment. One third of the cases demonstrated a need for more aggressive resuscitation of patients in hypovolemic shock. Nearly half involved either failure to operate or excessive delay in surgery. Medical care of the injured needs evaluation; the use of major trauma centers is discussed.

**Search terms:** Accident hospitals; Abdominal injuries /Fatalities; Shock (pathology) /Resuscitation; Abdominal injuries /Diagnosis; Abdominal injuries /Surgery; Hospitals /Medical records; Injury case reports /Abdominal injuries

**1/2 Injuries****HS-008 856 Fld. 1/2****TRAFFIC DEATHS DUE TO BLUNT ABDOMINAL TRAUMA**

Susan P. Baker; Harold R. Gertner; Robert B. Rutherford; Werner U. Spitz

Johns Hopkins Univ., Baltimore, Md., J03600; Maryland, Office of the Chief Medical Examiner, Baltimore, M07800

1970 10p

For presentation at American Association for Automotive Medicine 14th annual conference, Ann Arbor, Mich., 19 Nov 1970.

Hospital records and postmortem findings were reviewed for 33 cases in which a motor vehicle accident victim died from blunt abdominal trauma, in the absence of other significant injuries. In most instances the length of time

accidents /Accident investigation; Pedestrian accidents /Urban accidents; Pedestrian accidents /Accident causes; Accident case reports /Pedestrian accidents; Accident case reports /Data analysis; Accident case reports /Data acquisition

**1/3 Investigation and Records****HS-008 858 Fld. 1/3****TRAFFIC ACCIDENT RECORDS**

by Dwight M. McCracken; Gilbert N. Drake

Published in *ASSE Journal* v15 n12 p20-4 (Dec 1970)

Good, complete traffic accident records could be the key to reducing highway deaths. A highly advanced traffic record keeping system is described in detail. It will provide better information about when, where, and how accidents happen. This information is the cornerstone for building a safer highway environment.

**HS-008 857 Fld. 1/2; 1/3****PROGRESS REPORT ON ACCIDENT CASE STUDIES WITH SOME RESULTS OF PEDESTRIAN ACCIDENT CASES**

by J. R. Odendaal

South Africa. National Inst. for Road Research, Pretoria, S26400

Nov 1969 14p  
RT/10/69

Investigations of traffic accidents, data collection, and analysis procedures used are discussed. Special attention is given to 23 urban pedestrian accidents. The victims were running across a road diagonally, mainly between intersections, while showing almost total lack of vigilance. The sample is too small for generalization for the country as a whole. A total of 144 accidents of various types has been investigated.

**Search terms:** Accident investigation /Republic of South Africa; Pedestrian

records; Accident location; Accident causes; Accident investigation; Accident prevention; Driver records; Traffic records; Accident statistics

**HS-008 859 Fld. 1/3****A STUDY OF THE FREQUENCY AND TYPE OF TRACTOR OVERTURNS ON NEBRASKA HIGHWAYS AND FARMS**

by Rollin Schnieder; Robert J. Florell

Nebraska Univ., Lincoln. Cooperative Extension Service, N36100

Feb 1969 29p

The purpose of this study was to determine tractor overturn accident characteristics, the nature and extent of injury, the causes of the overturns, and what measures can be taken to prevent overturns or reduce their seriousness. Data from 100 accidents were studied; 42 resulted in death to the operator, 56

### 1/3 Investigation and Records (Cont'd.)

#### HS-008 859 (Cont'd.)

in injury, and 2 in no injury. It was found that 34% of the overturns involved operators under 20 years of age; that 48% of the operators had less than a high school education; that 78% were experienced in operating a tractor; that only nine of the tractors had some kind of protective device; that 42% of the accidents took place on a road; that the leading cause of accidents was improper operation of the tractor. The types of tractors involved in different types of overturn are discussed.

Search terms: Farm tractor accidents /Accident studies; Farm tractor accidents /Accident causes; Farm tractor accidents /Accident severity; Farm tractor accidents /Fatalities; Farm tractor accidents /Accident location; Farm tractor accidents /Injury severity; Farm tractor accidents /Rollover accidents; Age factor in accidents /Farm tractor accidents; Farm tractors /Driver experience; Farm tractors /Driver educational levels; Farm tractors /Safety devices; Farm tractor accidents /Nebraska

#### HS-008 860 Fld. 1/3

### THE ASSOCIATION OF ACCIDENT SEVERITY AND FREQUENCY WITH VEHICLE AGE. A STUDY IN THREE MICHIGAN COUNTIES FOR THE PERIOD 1 JANUARY TO 30 SEPTEMBER, 1966

by Joseph W. Little; William K. Hall

Published in *Accident Analysis and Prevention* v2 n1 p35-55 (May 1970)

7 refs

A study was made to determine whether the severity of a crash and the probability of a crash were functions of vehicle age. The important findings are: populations of autos involved in crashes of whatever severity and vehicle populations from which they are selected are not distributed statistically differently with respect to vehicle age;

when crashes are classified according to severity, populations of vehicles involved are not distributed statistically differently with respect to age. The data thus do not support the conclusion that aging makes crashes more likely. It appears instead that new vehicles may be overrepresented in crash populations. The statistical methods used in the analysis are discussed.

Search terms: Vehicle age /Accident severity; Vehicle age /Accident rates; Accidents by vehicle age /Statistical analysis; Accident analysis /Vehicle age; Accident analysis /Accidents by vehicle age; Accident studies /Michigan

#### HS-008 861 Fld.1/3

### MOTOR VEHICLE ACCIDENTOLOGY. A STUDY OF MOTOR VEHICLE ACCIDENT CAUSES

by Andrew J. White

Motor Vehicle Research of New Hampshire, Lee, M63000

1969 560p 13 refs

This is a textbook for persons involved in accident reconstruction and uses case histories, illustrations, and photographs as teaching media. The text is divided into eleven sections, which cover the following topics: examples of investigation procedures; safety devices and defective components of vehicles; accident reconstruction; defective investigations involving invalid conclusions; wheels and wheel rims; examples of need for attention to detail in accident investigation; tire facts in relation to vehicle accidents; vehicle payload and design limits; wheel bearings, lubricants, and brakes; farm tractor tires; useful formulae and weights and measures.

Search terms: Accident reconstruction /Accident case reports; Accident reconstruction /Photographs; Accident investigation; Accident causes /Defective vehicles; Accident

causes /Rims; Accident causes /Tires; Vehicle weight limits /Accident causes; Lubricants /Accident causes; Brakes /Accident causes; Wheel bearings /Accident causes; Tractor tires /Accident causes; Farm tractors /Tractor tires; Vehicle design /Accident causes; Safety devices; Accident causes /Wheels; Weight /Accident investigation; Measurement /Accident investigation

#### HS-008 862 Fld. 1/3; 1/2

### ROAD ACCIDENT AND CASUALTY RATES IN 1968

by H. D. Johnson

England. Road Research Lab., Crowthorne, Berks., E14400

1970 24p 7 refs  
Report no. RRL-LR-348

Accident and casualty rates for Great Britain have been calculated on the basis of traffic data obtained at about 1,300 sites in 1966, updated by applying trends at permanent census sites. For urban and rural areas, rates have been calculated separately for different classes of road user and vehicle, different severities of injury or accident, and different classes of road. When compared with 1966, an increase of casualty rates for motorcycle and scooter riders is shown, and a large decrease in the rates for car drivers and for all casualties combined; the accident rates per vehicle kilometre fell by about 14% in urban areas, 21% in rural areas, and 20% on motorways. Accident severity declined for all classes of road except motorways.

Search terms: Accident rates /Great Britain; Injury rates /Great Britain; Urban accidents /Accident rates; Rural accidents /Accident rates; Accident severity /Accident rates; Injury severity /Accident rates; Motorcycle accidents /Accident rates; Motor scooter accidents /Accident rates; Accident rates /Vehicle mileage; Highway characteristics /Accident rates

HS-008 863 Fld. 1/3;4/7

**INDUCED EXPOSURE REVISITED**

by William L. Carlson

Published in *HIT LAB Reports* p1-4  
(Nov 1970)

Two-car crashes for which only one of the drivers was considered responsible have been studied. The conclusions are: older vehicles are overinvolved; drivers over 55 and drivers between 16 and 25 are overinvolved; and the use of gross population data, combined with the concept of induced exposure, provides a useful tool for identifying overinvolved crash groups. It is recommended that more complete descriptions of drivers and vehicles should be obtained in order to test this technique further. Data on driver age are particularly needed.

**Search terms:** Accident responsibility /Vehicle age; Accident responsibility /Adolescent drivers; Accident responsibility /Young adult drivers; Accident responsibility /Adult drivers; Accident responsibility /Aged drivers; Accident responsibility /Statistical analysis; Accident rates /Statistical analysis; Accident risk forecasting; Accident analysis /Age factor in accidents; Demographic projections /Accident analysis

HS-008 864 Fld. 1/3;4/8

**THE USE OF ACCIDENT DATA FOR EVALUATING THE SAFETY OF URBAN TRANSPORTATION**

by Harriet Biddle; Murray Kamrass

Institute for Defense Analyses,  
Arlington, Va. Urban Mass  
Transportation Project, I280\$0Aug 1970 26p 6 refs  
Contract DAHC15-67-C-0011;  
DOT-UT-43 (IAA)  
Report No. N-742 (R);  
IDA-Log-HQ-70-11520; AD-711 597

Three primary factors are considered

applicable to the evaluation of transportation system safety - accident rate, injury rate, and death rate. Costs are also applicable but commensurable cost data do not seem to be available. Data are presented for some of these measures for three urban transportation modes - the automobile, the bus, and the subway. It is concluded that the available data are not adequate for making a full evaluation of the relative safety of urban transportation modes.

**Search terms:** Accident rates /Transportation systems; Urban transportation /Accident rates; Urban transportation /Injury rates; Urban transportation /Fatality rates; Subways /Accident rates; Subways /Injury rates; Subways /Fatality rates; Bus accidents /Accident rates; Bus accidents /Injury rates; Bus accidents /Fatality rates; Automobile accidents /Accident rates; Automobile accidents /Injury rates; Automobile accidents /Fatality rates; Accident statistics /Urban transportation

**AVAILABILITY:** NTIS**1/4 Locations**

HS-008 865 Fld. 1/4

**REPORT OF THE COMMITTEE ON HIGHWAY-RAILWAY GRADE CROSSING SAFETY PROGRAM**Committee on Highway-Railway Grade Crossing Safety Program (Canada),  
C5670\$0

30 Aug 1968 62p

A safety program for grade crossings in Canada is recommended. The problem of accidents at highway-railway crossings is multidimensional, involving the physical condition of the crossings, driver behavior, governmental responsibility, and the variety of existing laws. Crossing accidents have been studied and a three phase safety program suggested to develop public awareness of the problem. Accident statistics and legislation of the Canadian provinces regarding grade crossings are included.

**Search terms:** Railroad grade crossing accidents /Canada; Railroad grade crossing accidents /Accident statistics; Safety programs /Railroad grade crossings; Safety propaganda /Railroad grade crossings; Driver behavior /Railroad grade crossing accidents; Traffic laws /Railroad grade crossings

HS-008 866 Fld. 1/4;2/4

**A PROGRAM DEFINITION STUDY FOR RAIL-HIGHWAY GRADE CROSSING IMPROVEMENT**

by David W. Schoeppert

Voorhees (Alan M.) and Associates,  
Inc., McLean, Va, V186\$0Oct 1969 154p  
Report no. FRA-RP-70-2; PB-190 401

The objectives of this study were: to develop policies for railroad grade crossing improvement and to identify and describe projects needing action within six months. The study included the identification of available information on accident costs and motor vehicle operating costs and the preparation of estimates of the numbers of crossings in classes related to the volume of train movements and the volume of vehicle traffic. From these estimates, the number of crossings at which improvements would yield benefits in excess of costs was estimated together with the reduction in accidents which could be expected. Recommendations are included to correct data deficiencies and develop a comprehensive information system.

**Search terms:** Vehicle train collisions /Benefit cost analysis; Railroad grade crossings /Accident location; Accident costs; Vehicle operating costs; Benefit cost analysis /Accident location; Benefit cost analysis /Railroad grade crossing accidents; Traffic volume /Railroad grade crossings; Priorities /Accident location; Railroad grade crossing accidents /Accident studies; Vehicle train collisions /Accident studies; Warning systems /Railroad grade crossings

**AVAILABILITY:** NTIS

**2/0 HIGHWAY SAFETY****2/1 Breakaway Structures**

HS-008 867 Fld. 2/0

**MOBILITY WITHOUT MAYHEM**

President's Task Force on Highway Safety, Washington, D. C., P32500

Oct 1970 65p 39 refs

The nature of the highway safety problem is outlined. Recommendations for solving aspects of the problem and goals to be achieved are discussed. Management and supporting service aspects are described. It is recommended that action be taken on the following major elements of highway safety: highways, vehicles, drivers, enforcement, alcohol and drugs, pedestrians, emergency medical services, and public education.

Search terms: Highway safety; Vehicle safety; Driver behavior /Highway safety; Law enforcement /Highway safety; Alcoholic beverages /Highway safety; Drugs /Highway safety; Pedestrian safety; Emergency medical services; Highway safety programs /Management; Safety education; Highway safety /Safety campaigns

AVAILABILITY: GPO \$0.35

HS-008 868 Fld. 2/0

**A BIBLIOGRAPHY OF UNIVERSITY OF MICHIGAN PUBLICATIONS ON HIGHWAY SAFETY, 1966 TO MAY 1970**

by Kathleen Weber

Michigan Univ., Ann Arbor, Highway Safety Research Inst., H40800

1970 26p refs

This bibliography is in two parts: publications authored or sponsored by

individual authors; and publications in the area of auto and highway safety by members of the HSRI staff and other members of the University of Michigan faculty and staff since the establishment of the institute in 1966.

Search terms: Highway safety /Bibliographies; Vehicle safety /Bibliographies; Michigan Univ. Highway Safety Research Inst. /Bibliographies

HS-008 869 Fld. 2/0

**OPPORTUNITIES FOR RESEARCH AND PROGRAM DEVELOPMENT IN THE NATIONAL HIGHWAY SAFETY BUREAU FOR PERSONNEL ON SABBATICAL LEAVE**

National Highway Safety Bureau, Washington, D. C., N18000

Oct 1970 45p

The nature of the highway safety problem is outlined. Faculty members may receive temporary appointments to do research in highway and motor vehicle safety and in program development. Examples are given of the kinds of research which faculty members might do in the National Highway Safety Bureau.

Search terms: Vehicle safety/Safety research; Highway safety /Safety research; National Highway Safety Bureau /Personnel; Safety programs; Highway safety programs

**2/4 Design and Construction**

HS-008 870 Fld. 2/4; 1/3; 1/4

**INTERCHANGES**

by Joseph C. Oppenlander; Robert F. Dawson

Highway Users Federation for Safety and Mobility, Washington, D.C., H13400

Ch. 9 of *Traffic Control and Roadway Elements - Their Relationship to Highway Safety*, Revised.

Although additional research is still needed to provide a complete understanding of the relationship between interchange design and accident locations, rates, and patterns, some knowledge is available to improve the safety and operating characteristics of interchanges. Accident rates are discussed by proximity to interchange; type of interchange; type of ramp; acceleration lanes; deceleration lanes; speed change lanes; exits; weaving areas; and lane addition and drop.

Search terms: Interchanges /Accident location; Interchanges /Accident rates; Interchanges /Accident types; Highway design /Interchanges; Accident rates/Ramps; Acceleration lanes/Accident rates; Deceleration lanes/Accident rates; Speed changes /Accident rates; Exits /Accident rates; Weaving /Accident rates; Lane drops /Accident rates; Traffic lanes/Accident rates

HS-008 871 Fld. 2/4

**PAVEMENT TESTING: A SAFETY AID**

by Francis X. Schwartz

Published in *Public Works* v101 n12 p67-71 (Dec 1970)

Roads and runways can be tested for friction, texture depth, riding quality, surface quality, abrasion, wear, compression and splitting, and freeze-thaw effects. These studies can make pavement safer for use under all conditions. Skid research is particularly important to safety. Skid testing equipment is described. Anti-skid actions which may be taken after testing shows a need for them

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coatings, and improving the traction quality of painted stripes and markers. Roughness and rideability testing are also important for safety and comfort.

**Search terms:** Pavement tests /Highway safety; Pavement friction/Pavement tests; Pavement surface texture/Pavement tests; Pavement skid resistance/Pavement test; Pavement skidding characteristics /Pavement tests; Pavement markings /Traction; Grooving/Pavement skid resistance; Road surfaces/Road materials; Antiskid coatings/Pavement skid resistance; Abrasion tests /Pavement tests; Wear tests /Pavement wear; Temperature endurance tests /Pavement tests

**HS-008 872 Fld. 2/4; 1/3**

### CROSS SECTION AND PAVEMENT SURFACE

by John A. Dearinger; John W. Hutchinson

Highway Users Federation for Safety and Mobility, Washington, D. C., H13400

1970 27p 150 refs

Ch. 7 of *Traffic Control and Roadway Elements - Their Relationship to Highway Safety*. Revised.

It is difficult to assess the nature and extent of the relationship between the cross sectional elements of a highway and the accidents on it. This chapter reviews the highway safety aspects of research on the elements of the cross section. Significant research concerning the pavement, number of lanes and lane width, shoulders, drainage, medians, barriers, and road hazards is reported. Research needs are also discussed. Skidding accidents and pavement skid resistance are discussed.

**Search terms:** Accident rates /Highway design; Pavement skid resistance; Pavement skidding

characteristics /Skidding accidents; Lane width; Traffic lanes; Road shoulders; Roadside hazards; Medians; Barriers; Drainage; Highway research

**HS-008 873 Fld. 2/4; 1/4**

### EVALUATION OF A FEDERAL AID SAFETY PROJECT

Michigan. Dept. of State Highways, Lansing. Traffic and Safety Div., M31200

Jun 1968 25p

A street and intersection improvement project in Lansing is described. The street was widened from four to five lanes to provide a center lane for left turns and the construction of roadside control. Accidents at this location were reduced from 65 the year before the improvement to 33 the year after the improvement. Benefits and costs are discussed.

**Search terms:** Accident location /Benefit cost analysis; Left turn lanes /Benefit cost analysis; Highway improvements /Intersections; Highway improvements /Benefit cost analysis; Traffic control /Intersections; Accident rates /Intersections; Federal aid /Highway improvements

### 2/5 Lighting

**HS-008 874 Fld. 2/5**

### SOME CURRENT VIEWS IN THE UNITED KINGDOM OF PROBLEMS OF NIGHT VISIBILITY

by A. W. Christie; R. L. Moore

England. Road Research Lab., Crowthorne, Berks., E14400

1970 10p 14 refs

Reprinted from the documentation for the 10th International Study Week in Traffic and Safety

Engineering, Rotterdam, 7-11 Sep 1970, Theme 3: Recent Developments in Methods of Improving Night Visibility.

The method now adopted in the United Kingdom for deciding whether or not a principal road should be lighted is outlined. The draft International Regulations for Public Lighting being discussed by the Commission Internationale de l'Eclairage involve technical procedures which, although possibly correct, lead to results not greatly different from those arrived at by the simpler British Standard Code of Practice. The interaction of street lighting and vehicle lighting is discussed, and two devices which would make the use of headlights in well lighted streets visually acceptable are briefly described. These are automatic dimming of headlights and the use of polarized headlights.

**Search terms:** Street lighting /Great Britain; Highway lighting standards /Great Britain; Highway lighting standards /International factors; Lighting standards /International factors; Vehicle lighting /Street lighting; Polarized headlamps; Low beamed headlamps; Night visibility

### 2/7 Meteorological Conditions

**HS-008 875 Fld. 2/7**

### A COMPARISON OF AIRCRAFT AND GROUND VEHICLE STOPPING PERFORMANCE ON DRY, WET, FLOODED, SLUSH, SNOW-, AND ICE-COVERED RUNWAYS. FINAL REPORT ON PROJECT COMBAT TRACTION, A JOINT USAF-NASA PROGRAM

by Thomas J. Yager; W. Pelham Phillips; Walter B. Horne; Howard C. Sparks

Langley Research Center, NASA, Hampton, Va., L03000; Aeronautical Systems Div., Wright-Patterson AFB, Ohio A08600

**2/7 Meteorological Conditions  
(Cont'd.)**

HS-008 875 (Cont'd)

Nov 1970 199p 14 refs  
Report no. NASA-TN-D-6098

Appendix D by R. W. Sugg, British Ministry of Aircraft Supply.

A joint USAF-NASA research program has studied the stopping performance of an instrumented C-141A four-engine jet transport and several instrumented ground vehicles on 50 runways in the United States and Europe under dry, wet, flooded, slush, snow, and icy conditions. It is shown that measurements of the stopping distance of a diagonal braked ground vehicle provides a meaningful measure of the slipperiness of a wet runway, and permits accurate prediction of the stopping distance of an aircraft under varied runway slipperiness conditions as well as a means for realistic calculation of crosswind limitations. It is also shown that aircraft stopping performance on a wet runway can be considerably improved either by grooving the runway or by use of a porous surface course.

**Search terms:** Stopping distance /Dry road conditions; Stopping distance /Icy road conditions; Stopping distance /Slush; Stopping distance /Snow; Instrumented vehicles /Stopping distance; Grooving /Runways; Grooving /Stopping distance; Aircraft /Stopping distance; Pavement surface texture /Stopping distance; Runway surfaces /Stopping distance; Stopping distance /Braking; Crosswind /Stopping distance

**2/8 Police Traffic Services**

HS-008 876 Fld. 2/8; 4/1

**JAPAN'S NEW PRISON FOR SELECTED TRAFFIC OFFENDERS**

by Billie J. Watson

Published in *Traffic Digest and*

Review v19 n1 p6-10 (Jan 1971)

Ichihara Prison is an "open" institution for first offenders who were convicted for causing death and/or injury through gross negligence while driving, but who have never been imprisoned before. All the prisoners work, and those who will be allowed to renew their drivers' licenses after release are taught driving safety. An experimental program of open treatment is being carried out. Less than 1% of the discharged inmates have committed another offense.

**Search terms:** Driver rehabilitation /Japan; Traffic law violators /Driver rehabilitation; Traffic law violators /Negligence; Driver license renewal /Driver rehabilitation

**3/0 HUMAN FACTORS****3/1 Alcohol**

HS-008 877 Fld. 3/1

**ALCOHOL AND HIGHWAY SAFETY. A SELECTED BIBLIOGRAPHY**

by Lucille McClure

Martin Marietta Corp., Orlando, Fla. Technical Information Center, M06900

31 Aug 1970 50p 532 refs  
Report no. RB-223

This bibliography covers alcoholism only as it relates to highway safety, alcohol safety countermeasures, or public opinion. So much has been published in this field that only the most pertinent citations and current references have been listed.

**Search terms:** Drinking drivers /Bibliographies; Driver intoxication /Bibliographies; Alcoholism /Bibliographies; Alcohol usage deterrents /Bibliographies; Alcohol education /Bibliographies; Highway safety /Drinking drivers; Public opinion /Drinking drivers

HS-008 878 Fld. 3/1

**GASOLINE, ALCOHOL, AND BLOOD**

by Virginia Wayland

Published in *Highway User* p10-3, 21 (Sep 1970)

The drinking driver problem is outlined and the significance of various blood alcohol levels explained. Research suggests that alcoholics contribute significantly to the problem. Implied consent laws are discussed. Some progress is being made in controlling the problem.

**Search terms:** Blood alcohol levels; Drinking drivers; Driver intoxication; Implied consent laws; Alcoholism /Problem drivers

HS-008 879 Fld. 3/1

**BLOOD ALCOHOL TESTING FOR MOTOR VEHICLE DEATHS, WISCONSIN, 1969**

Wisconsin. Dept. of Health and Social Services, Madison. Div. of Health, W1952P

Mar 1970 24p

Blood alcohol tests were made on 56% of the persons killed in motor vehicle accidents. Of 422 drivers tested, 64% showed some alcohol content in the blood. Male drivers had higher blood alcohol than female drivers; more men were driving than women, who were chiefly passengers; the worst drinking-driving fatality age group for males is 20-24; over 42% of the fatalities occur after midnight; Saturday and Sunday are the worst accident days; and there was random fluctuation in monthly data.

**Search terms:** Blood alcohol levels /Male drivers; Blood alcohol levels /Female drivers; Blood alcohol levels /Young adult drivers; Time of accidents /Drinking drivers; Drinking drivers /Fatalities; Accident

statistics /Drinking drivers; Accident Statistics /Blood alcohol levels; Alcohol blood tests/Accident statistics; Blood alcohol levels /Pedestrians

**HS-008 880 Fld. 3/1**

### EFFECTS OF ALCOHOL ON COMPLEX PERFORMANCE

by W. Dean Chiles; Alan E. Jennings

Federal Aviation Administration, Oklahoma City, Okla., F03900

Aug 1969 16p 10 refs  
Report no. AM-69-14; AD-703 633

Nine subjects were tested on a battery of tasks involving monitoring (simple reaction time, choice reaction time, and meter monitoring), two-dimensional compensatory tracking and mental arithmetic. Three workloads were presented: monitoring plus tracking, monitoring plus arithmetic, and monitoring plus tracking plus arithmetic. The subjects practiced for three daily sessions, made a baseline test on the fourth, and an alcohol test on the fifth. They ingested 2.5 ml. of an alcohol beverage per kilogram of body weight two hours before the alcohol test; mean blood alcohol at the beginning of testing was 102 mg.%. Significant workload effects were found for three of the four measures of tracking performance, for simple reaction time, and for movement time in the choice reaction time in task. Significant alcohol effects were found for reaction time choice reactions, detection times for meter signals, and for three of the four measures of tracking.

**Search terms:** Driver performance /Alcohol effects; Alcohol effects/Reaction time; Blood alcohol levels; Alcohol effects /Driving tasks

AVAILABILITY: NTIS

**HS-008 881 Fld. 3/1**

by G. M. Bastarache

Published in *Highway User* p8-11 (Nov 1970)

Generally, drunk driving laws and their enforcement are stricter in Europe than in the United States. Europeans, particularly the Scandinavian countries, have had long experience in combatting drunk drivers and have a lower proportion of traffic deaths caused by drinking than the U. S. National drinking patterns and enforcement of drunk driving laws in Great Britain and the Scandinavian countries are described. Their experience may prove useful to the United States in attempting to solve the drunk driving problem.

**Search terms:** Alcohol laws/Great Britain; Alcohol laws/Scandinavia; Drinking drivers/Alcohol laws; Driver intoxication/Alcohol laws; Alcohol laws/Law enforcement; Alcohol usage deterrents/Great Britain; Alcohol usage deterrents/Scandinavia

### 3/4 Driver Behavior

**HS-008 882 Fld. 3/4**

### PRACTICAL DRIVING TIPS FOR BETTER, SAFER DRIVING, FROM AMERICA'S PROFESSIONAL TRUCK DRIVERS

American Trucking Associations, Inc., Washington, D. C., A42650

n.d. 28p

Advice is given on general auto safety and care; driving in heavy traffic; on freeways; at dusk and at night; during the spring, summer, fall, and winter; during vacation; and in fog, rain, snow, and ice conditions.

**Search terms:** Driver skills; Driving; Freeway driving; Winter driving; Night driving; Icy road conditions /Driving conditions; Fog /Driving conditions;

congestion /Driving conditions; Wet road conditions /Driving conditions; Reduced visibility /Driving conditions; Recreational driving; Twilight driving; Spring /Driving conditions; Summer /Driving conditions; Fall /Driving conditions

AVAILABILITY: Corporate Author

**HS-008 883 Fld. 3/4**

### JUDGMENT OF VEHICLE SPEED AND TRAFFIC PATTERNS. PHASE 1. INTERIM REPORT

by H. W. Case; S. F. Hulbert

California Univ., Los Angeles Inst. of Transportation and Traffic Engineering, C21000

Feb 1970 27p 8 refs  
Report no. PB-192 477

Analysis of 1,068 subjects' speed estimations of a 16 mm motion picture taken from an automobile moving along a freeway demonstrates the following: a negative correlation with age, older drivers making slower speed estimates; a positive correlation among trials, drivers being consistent in their estimates; estimations relation among trials, drivers being consistent in their estimates; estimations within each trial covered a range of 50 to 80 mph; and a possible negative influence of bringing the attention of the viewer to the posed speed limit so that estimates were lower. The study sought to establish the differential between speed estimation *per se* as a judgment factor, and speed estimation in combination with traffic patterns and movements of other vehicles.

**Search terms:** Age factor in driving /Speed patterns; Speed limits; Speed studies/Driving simulation; Speed studies/Traffic simulation; Speed studies /Cinematographic simulation; Freeway driving /Speed studies; Freeway driving /Driving simulation; Speed studies /Traffic

**HS-008 884 Fld. 3/4; 2/9**

**JUDGMENT OF VEHICLE SPEED AND TRAFFIC PATTERNS: PHASE 2. INTERIM REPORT**

by H. W. Case; S. F. Hulbert

California Univ., Los Angeles. Inst. of Transportation and Traffic Engineering, C21000

May 1970 47p 10 refs  
Report no. PB-193 865

Analysis of 170 subjects' speed estimations and traffic pattern judgments from a 16mm motion picture taken from an auto moving along a freeway demonstrates the following: a positive correlation between speed estimation trials of all four films, drivers being consistent in their estimations; no correlation between speed estimations *per se* and traffic pattern judgments with implied estimations; a reduction of the range of speed estimations with the exclusion of older drivers, raising the lower end of the range; and a negative influence of a posted 35 mph sign, which caused subjects to make lower estimates.

Search terms: Driver behavior research/Speed patterns; Driver behavior research/Traffic flow; Driver behavior research/Cinematographic simulation; Cinematographic simulation/Traffic simulation; Age factor in driving/Speed patterns; Speed signs

**AVAILABILITY:** NTIS

**HS-008 885 Fld. 3/4; 3/12**

**HUMAN FACTORS ANALYSIS OF DRIVER BEHAVIOR BY EXPERIMENTAL SYSTEMS METHODS**

by Karl U. Smith; Henry S. R. Kao; Richard Kaplan

Published in *Accident Analysis and Prevention* v2 n1 p11-20 (May 1970)

This research describes an investigation of the automobile and driver visual-motor characteristics by means of closed circuit television and real time computer methods. An attempt was made to apply systems concepts to an understanding of the auto and driver as a specialized control system wherein the car is viewed as a rigid wheeled exoskeleton of the driver's body. It was concluded that different lateral displacements of vision would affect drivers' steering accuracy. Conclusions regarding the research methods and their applications are also presented.

Search terms: Driving task analysis /Vision; Lateral displacement effect /Steering; Motor skills/Driving task analysis; Driver behavior research/Closed circuit television; Driving task analysis /Closed circuit television; Driver behavior research/Real time operations; Driving task analysis /Real time operations; Driver behavior research/Systems analysis; Driving task analysis /Systems analysis; Computerized simulation/Driving task analysis; Computerized simulation/Driver behavior research; Driver behavior research/Steering; Driving task analysis /Steering

**3/5 Driver Education**

**HS-008 886 Fld. 3/5**

**CALLED FOR ICING**

by Bill Sanders

Published in *Motor Trend* v22 n12 p54, 56, 82 (Dec 1970)

A Swedish course in winter driving safety is described. Classroom instruction is combined with practice on a frozen lake. Drivers learn how to brake on a slippery surfaces, how to handle front and rear end skids. Studded tires are used on the cars, which have front wheel drive.

Search terms: Driver education/Winter driving; Front

wheel drive automobiles /Vehicle handling; Studded tires/Winter driving; Skidding /Vehicle handling; Icy road conditions/Braking; Winter driving /Sweden; Skid pans/Driver education; Classroom driver instruction /Winter driving

**3/6 Driver Licensing**

**HS-008 887 Fld. 3/6**

**TRAFFIC VIOLATIONS BY TYPE, AGE, SEX, AND MARITAL STATUS**

by David M. Harrington; Robin S. McBride

Published in *Accident Analysis and Prevention* v2 n1 p67-79 (May 1970)

17 refs

Study of the records of California drivers showed that the mileage-adjusted rate of speed, equipment, and major violations decreases with increasing age. Sign, turning, passing, and right of way violations have a U-shaped relationship with age. Males have a higher rate than females for speed, equipment, passing, and major violations, and a lower rate for sign and right of way violations, with little difference for turning violations. Single persons average a greater number of each type of violation than married persons. Similar age and sex differences were found for violations associated with fatal and injury accidents.

Search terms: Driver records/Traffic law violations; Traffic law violations/Male drivers; Traffic law violations/Female drivers; Traffic law violations/Age factors; Traffic law violations/Signs; Traffic law violations/Turning; Traffic law violations/Passing; Traffic law violations/Right of way (traffic rules); Traffic law violations/Driver marital status; Male drivers/Accident rates; Female drivers/Accident rates

MAY 7, 1971

HS-008 888 Fld. 3/6; 3/4

## THE STABILITY OF DRIVING RECORD OVER TIME

by Albert Burg

Published in *Accident Analysis and Prevention* v2 n1 p57-65 (May 1970)

7 refs

Six-year driving records on accidents and traffic convictions were obtained for 7,841 California drivers of both sexes and all ages. From analysis of these data it was concluded that: the vast majority of accidents involve previously accident-free drivers; thus traffic safety efforts should be directed toward "normal" drivers; conviction experience is more stable than accident experience, and both are more stable for males; thus prediction of future driving performance will be more successful for male drivers and for convictions than for accidents; driving record information becomes more reliable over a longer period of time; thus for research it is desirable to use as long a time period as possible as a data base.

Search terms: Driver records /Statistical analysis; Accident free drivers; Traffic law violations; Driver performance /Driver records; Male drivers /Driver records; Female drivers /Driver records; Male drivers /Accident rates; Female drivers /Accident rates; Age factor in driving; Age factor in accidents; Convictions/Driver records; Driver records /California; Highway safety programs

## 3/11 Pedestrians

HS-008 889 Fld. 3/11; 2/9; 1/3

## PEDESTRIANS

by Edward A. Mueller; Woodrow W. Rankin

1970 11p 53 refs

Ch. 8 of *Traffic Control and Roadway Elements Their Relationship to Highway Safety. Revised*.

A reduction in pedestrian accidents has been achieved through the use of traffic control devices and other traffic control measures. One way traffic operation, although generally established to improve flow, has resulted in improved pedestrian safety particularly in central city areas. Traffic signal visibility improvement, installation of over-the-roadway vehicle signals and pedestrian signal indications, and improved pedestrian visibility through better street lighting or reflective marking of individual pedestrians have also proved effective. The effectiveness of marked crosswalks and the enforcement of ordinances controlling street crossings by pedestrians in improving pedestrian safety has yet to be definitely established.

Search terms: Pedestrian accidents /Accident prevention; Pedestrian safety /Traffic control devices; Pedestrian safety /One way traffic; Pedestrian safety /Urban areas; Pedestrian regulations; Pedestrian crossings /Pedestrian safety; Pedestrian safety /Crosswalks; Pedestrian accidents /Accident rates; Pedestrian visibility /Street lighting; Pedestrian visibility /Reflectors; Traffic signal visibility /Pedestrian safety

## 3/12 Vision

HS-008 890 Fld. 3/12

## SIGNIFICANT POINTS FROM THE DIAGNOSTIC FIELD STUDIES. SUMMARY REPORT

by D. L. Woods; N. J. Rowan; J. H. Johnson

## OTHER SAFETY RELATED AREAS

Contract FH-11-7031

Report no. PB-194 983; RR-606-4

The primary objectives of the research project in diagnostic studies of highway visual communication systems are: to review the current practices in vital communications and identify problem areas; to initiate recommendations for alleviating these problem areas; and to develop the diagnostic study technique for evaluation of highway design and traffic operations. This report covers study sites and procedures; driver expectancy; highway design; signing; pavement markings and markers; delineation; roadway lighting; traffic signals; evaluation and staff recommendations.

Search terms: Highway communication /Vision; Vision /Highway design; Visual perception /Highway design; Signs /Visual perception; Pavement markings /Visual perception; Delineators (traffic) /Visual perception; Highway lighting /Visual perception; Traffic signals /Visual perception; Eye research; Driver behavior /Visual perception; Driving task analysis /Visual perception

## AVAILABILITY: NTIS

## 4/0 OTHER SAFETY- RELATED AREAS

## 4/1 Codes and Laws

HS-008 891 Fld. 4/1; 1/3

## EFFECTIVENESS OF SPEED LIMITS ON RURAL ROADS AND MOTORWAYS

by R. F. Newby

England. Road Research Lab., Crowthorne, Berks. E14 1AA

**4/1 Codes and Laws (Cont'd.)**

HS-008 891 (Cont'd.)

for the 10th International Study week in Traffic and Safety Engineering, Rotterdam, 7-11 Sep 1970, Theme 7.

Experience in Great Britain and a review of recent papers confirm that speed limits can reduce vehicle speeds and thus decrease the number of accidents and the severity of injury on rural roads as well as urban roads. It is not possible to demonstrate that such benefits are present on every length of road because of the random scatter which exists due to the difficulty of obtaining sufficient data. More refined criteria are needed for determining the speed limit appropriate to each case to obtain the best balance between traffic delay and accident data. A recent attempt to formulate such a set of criteria is described.

Search terms: Accident rates /Speed limits; Speed limits /Great Britain; Speed limit effectiveness /Accident prevention; Speed limits /Rural roads; Speed limits /Urban highways; Traffic delay minimization /Speed limits; Injury severity /Speed limits; Speed limits /Reviews

HS-008 892 Fld. 4/1; 4/4

**VOLPE "PICTURES" DOT'S THINKING ON FEDERAL AID HIGHWAY LEGISLATION**

by John A. Volpe

Published in *Carolina Highways* v24 n9 p14-5, 26-8 (Sep 1970)

Testimony of the Secretary of Transportation before the U. S. Senate Subcommittee on Public Works regarding pending and proposed federal highway legislation is presented. The testimony deals with the interstate system, urban transportation, billboard problems, highway safety, drinking drivers, and highway planning.

Search terms: Interstate Highway System; Highway planning /Federal aid; Highway safety; Urban transportation; Drinking drivers; Highway beautification; Federal laws /Highway planning; Billboards

**4/7 Mathematical Sciences**

HS-008 894 Fld. 4/7; 2/9

**STUDY OF SPEED TRENDS: THE FIRST FOUR YEARS**

by B. E. Fernie

South Africa. National Inst. for Road Research, Pretoria, S26400

Oct 1969 18p  
Report no. RT/6/69

Since 1966 annual studies of vehicle speeds on rural roads have been made at ten points. Speed distributions observed in each of four years are compared at the 10th, 20th, 30th, 40th, 50th, 60th, 70th, and 85th percentiles, and for light vehicles at the average speeds and the percentage beyond 80 mph. The method used was the Friedman analysis of variance of ranks. Significant increases of between 1 and 4 mph were found in all the lower percentiles up to the median, except the 10th percentiles of speeds of heavy vehicles. The higher percentiles did not alter significantly. Average speeds of light motor vehicles increased, and more traveled at over 80 mph in 1969 than in 1967.

Search terms: Speed studies /Republic of South Africa; Speed studies /Rural roads; Speed studies /Variance analysis; Speed studies /High speed; Speed patterns /Heavy duty vehicles

**4/8 Transportation Systems**

HS-008 895 Fld. 4/8

**OVERCOMING OBSTACLES TO SYSTEM SAFETY IN THE SURFACE MODES OF TRANSPORTATION**

by Henry H. Wakeland

National Transportation Safety Board, Washington, D. C., N30000

Published in *Annals of Reliability and Maintainability*. Vol. 9. Assurance

AVAILABILITY: Corporate author \$0.60

*Technology Spinoffs* (P-32), New York, 1970, p608-13

#### Report no. SAE-700650

Presented at Reliability and Maintainability Conference (9th), Detroit, Mich., 20-22 Jul 1970.

The national need for system safety is primarily in the surface modes. An organization chart for system safety is used to discuss application problems in the surface modes from diffuse organization historical non-systematic development, and barriers to communication or control. Favorable developments in system organization and steps to promote applications of system safety are discussed. Discussion includes highway transportation, railroad safety, marine transportation, recreational boating, and pipeline transportation.

Search terms: Transportation systems /Safety research; Highway transportation; Railroads /Safety programs; Marine transportation /Safety programs; Pipelines /Safety programs; Recreational boating /Safety programs; Highway safety programs

AVAILABILITY: SAE

## 5/0 VEHICLE SAFETY

### HS-008 896 Fld. 5/0

**NATIONAL COMMISSION ON PRODUCT SAFETY FINAL REPORT PRESENTED TO THE PRESIDENT AND CONGRESS**

National Commission on Product Safety, Washington, D. C., N14100

Jun 1970 216p refs

This general report on product safety includes: perspectives on product safety; household product risks to consumers; the collection and use of injury data; industry self regulation through standards and safety practices; consumer education; the economics of safety; law and administration,

including common law remedies available to consumers after injury; state and local regulation; federal regulatory methods; federal capabilities for product safety testing; product safety abroad; and a recommended charter for consumer safety. The text of a proposed Consumer Product Safety Act is included. Vehicle safety is one of the many topics included in various chapters.

Search terms: Product safety /Legal factors; Federal control /Product safety; Product safety /International factors; Consumer protection; Consumer education; Hazards; Safety laws; Safety device costs; Defective products /Injury causes; Injury statistics; Product safety /Standards; Product safety /Tests; Vehicle safety; Manufacturing standards; Manufacturers liability /Defective products

AVAILABILITY: GPO \$1.75

### HS-008 897 Fld. 5/0

## A POSITION PAPER ON VEHICLE SAFETY

by Nicholas Perrone

Catholic Univ. of America, Washington, D. C., C33900

Sep 1970 53p 34 refs

The development and significance of safety standards are discussed. It is recommended that air bags and crashworthiness should be emphasized. Special attention should be paid to the instrument panel, hard internal spots, the front seat, bumpers, and the side of the car, all of which should be more crashworthy. Chemically tempered laminated glass should be used throughout the car. Vehicle safety is analyzed from the cost/benefit viewpoint, and aviation crashworthiness is examined in the same context. The question of resource allocation is also examined.

Search terms: Vehicle safety standards; Air bag restraint systems; Crashworthiness; Instrument panels /Crashworthiness; Front seats /Crashworthiness; Bumpers /Crashworthiness; Crashworthy bodies; Benefit cost analysis /Vehicle safety; Benefit cost analysis /Aircraft safety; Chemically strengthened glass; Laminated glass; Automobile interior design /Crashworthiness; Priorities /Vehicle safety

### HS-008 898 Fld. 5/0

## THE DEVELOPMENT OF MOTOR VEHICLE SAFETY STANDARDS

by H. M. Jacklin, Jr.

National Highway Safety Bureau, Washington, D. C., N18900

Published in *Annals of Reliability and Maintainability*, Vol 9, Assurance Technology Spinoffs (P-32), New York, 1970, p628-34

Report no. SAE-700653

Presented at Reliability and Maintainability Conference (9th), Detroit, Mich., 20-22 Jul 1970.

Criteria are discussed concerning development of federal motor vehicle safety standards and compliance with them. Present and new standards are continuously evaluated in terms of system safety and standards are updated in terms of minimum requirements for application to specific categories of vehicles and equipment. The interrelationship of reliability and maintainability requirements to vehicle safety is receiving increased system safety emphasis, and steps are being taken to include such requirements in the standards under development for new vehicles and vehicles in use.

Search terms: Vehicle safety standards; Safety standards compliance; Vehicle safety /Reliability; Vehicle safety /Maintainability; Used automobile standards

AVAILABILITY: SAE

**5/1 Brake Systems****HS-008 899 Fld. 5/1****BRAKE FLUIDS AND BRAKE FLUID SPECIFICATIONS IN EUROPE**

by P. W. Meyer

Dow Chemical Europe S. A., Horgen (Switzerland), D23700

1971 12p 11 refs  
Report no. SAE-710252

Presented at Automotive Engineering Congress, Detroit, Mich., 11-15 Jan 1971.

An attempt at an overall view of the very complex brake fluid situation existing in Europe today is presented. It is hoped that it will create a better understanding of the actual realistic requirements that have to be set for modern and safe brake fluids. It is further hoped that it may help to pave the way for an international standardization of brake fluid specifications and test methods.

**Search terms:** Brake fluids/European vehicles; Brake fluids /Specifications; Brake fluids / Materials; Brake fluids /Physical properties; Brake fluids /Performance characteristics

**AVAILABILITY: SAE****HS-008 900 Fld. 5/1****MACHINE TESTING FOR BRAKE LINING CLASSIFICATION**

by A. J. Wilson; G. T. Bowsher

Girling Ltd., Birmingham, Warwick (England), G18300

1971 10p  
Report no. SAE-710249

Presented at Automotive Engineering Congress, Detroit, Mich., 11-15 Jan 1971.

Methods of testing brake linings by sample machine have been evolved to a standard of consistency which enables the performance of a brake to be evaluated by consideration of the geometry of the system and the coefficient of friction of the lining. This situation does, however, only hold if the way in which the lining is tested bears a close relationship to the duty cycle employed on an actual brake. In this paper the correlation between brake performance and estimates based on scale testing shows that a classification can be employed to simplify the choice of replacement linings when a single material is employed. Duo servo brakes are least amenable to this technique because of their high sensitivity.

**Search terms:** Brake lining tests/Friction materials; Friction materials /Sampling; Friction tests /Brake linings; Brake tests /Scale models; Drum brakes/Wear tests; Duo servo brake systems; Drum brakes/Temperature endurance tests; Brake lining tests/Speed

**AVAILABILITY: SAE****5/2 Buses, School Buses, and Multipurpose Passenger Vehicles****HS-008 901 Fld. 5/2****MINIMUM REQUIREMENTS FOR SCHOOL BUS CONSTRUCTION AND EQUIPMENT**

Vehicle Equipment Safety Commission, Washington, D. C., V01800

Jan 1971 30p  
Report no. Regulation VESC-6

The Vehicle Equipment Safety Commission, representing 44 states, prepared a standard for school bus construction and equipment to provide improved protection for

children and to serve as model legislation for all states. The standard covers construction of the school bus body, chassis, electrical system, and equipment requirement for emergencies.

**Search terms:** School bus standards; School bus bodies; School bus chassis; Emergency equipment/School buses; Electric systems/School buses; State laws/School buses; School bus passengers /Occupant protection

**5/4 Design****HS-008 902 Fld. 5/4****CRASHWORTHINESS AND BIOMECHANICS OF VEHICLE IMPACT**

by Nicholas Perrone

Catholic Univ. of America, Washington, D. C., C33900

Sep 1970 42p 47 refs  
Grant NSF-GK-23747  
Report no. PB-194 820

Presented at colloquium on Dynamic Response of Biomechanical Systems, ASME annual meeting, New York, 2 Dec 1970.

Background information on crashworthiness and vehicle impact is presented. The changing nature of the field is observed by considering innovations of the last few years that have had a significant effect on safety level. The difficulties of designing for impact attenuation are examined and use of a unit crashworthy element is recommended. The transversely loaded tube is recommended as a worth while possibility. The air bag is considered to be a favorable development, but to be approached cautiously. Energy absorbing systems from frangible tubes to frame assemblies are examined, and general assessments are given of their potentials.

MAY 7, 1971

VEHICLE SAFETY

Search terms: Energy absorbing systems; Crashworthiness/Automobile design; Impact attenuation/Automobile design; Air bag restraint systems; Crashworthy bodies; Fragmenting tubes/Impact attenuation; Tubes/Impact attenuation; Biomechanics/Impact forces

AVAILABILITY: NTIS

HS-008 903 Fld. 5/4

THE INFLUENCE OF LUBRICATING OIL ASH ON SURFACE IGNITION PHENOMENA

by A. Marciante; P. Chiampo

Fiat S.p.A., Turin (Italy), F10200

1970 13p 26 refs  
Report no. SAE-700458

Presented at SAE Mid-year Meeting, Detroit, Mich., 18-22 May 1970.

A test method suitable for evaluating the lubricant oil influence on surface ignition has been developed. The effects on this phenomenon of oils without additives, oils with ashless additives, and oils with organometallic additives have been studied. In addition, the influence of additive introduction rate in the combustion chamber has been investigated and evaluated.

Search terms: Lubricant additives/Preignition; Ignition tests/Preignition; Ignition tests/Fiat S.p.A.; Mineral oils/Preignition; Lubricating oils/Ash content

AVAILABILITY: SAE

HS-008 904 Fld. 5/4

A NEW APPROACH TO IMPACT

Catholic Univ. of America, Washington, D.C., C33900

Feb 1970 24p 21 refs  
Grant GK-2802  
Report no. 15; PB-190 159

Impact attenuation associated with vehicle accidents is reviewed. Technical and economic problems in the design of energy absorbing devices are discussed. The main technical problems are very large deformations and rate sensitivity effects. A specific new structural element for impact attenuation is suggested, the tube. Preliminary calculations have been performed to determine design curves for steel tubes. Application of this energy absorbing element for various parts of the vehicle is discussed. The overall crashworthiness problem is outlined.

Search terms: Impact attenuation/Tubes; Crashworthiness/Vehicle design; Energy absorption/Tubes; Deformation; Energy absorbing systems

AVAILABILITY: NTIS

HS-008 905 Fld. 5/4

FIELD ASSISTED GLASS SEALING

by G. Wallis

Mallory (P. R.) and Co., Inc., Indianapolis, Ind., M02000

1971 7p  
Report no. SAE-710123

Presented at Automotive Engineering Congress, Detroit, Mich., 11-15 Jan 1971.

A new technique is described which seals glass-to-metal and insulator-to-insulator at relatively low temperatures and short times. The materials remain essentially solid throughout the sealing cycles. No intermediate foreign materials such as

dimensional and optical tolerances during the formation of clean, hermetic, and bakeable seals.

Search terms: Glass to metal seals/Surface treatment; Glass to metal seals/Hermetic seals; Glass to metal seals/Evaluation

AVAILABILITY: SAE

HS-008 906 Fld. 5/4

PUMPABILITY OF MULTIGRADE ENGINE OILS AT LOW TEMPERATURE

by M. F. Smith, Jr.; J. P. Graham

Enjay Labs., Linden, N.J., E16800

1971 15p  
Report no. SAE-710139

Presented at Automotive Engineering Congress, Detroit, Mich., 11-15 Jan 1971.

The low temperature pumpability performance of multigrade engine oils was evaluated in several U. S. and European engines. Test oils included both experimental formulations and commercial service station oils; test temperatures ranged between -20°F and 0°F. The time of oil to reach engine rocker arms after startup at -15°F and -20°F was not related to low temperature lubricant properties such as pour point and Brookfield viscosity. Pumpability, i.e. oil gallery pressurization rate, of the oils improved markedly in successive cold temperature starts, probably due to fuel dilution and shearing of microstructures in the oil. Engine design features can significantly affect pumpability performance.

Search terms: Lubricating oil tests/Viscosity; Lubricating oils/Rheological properties; Lubricating oils/Low temperature fluidity; Lubricating oil tests/Oil pressure; Lubricating oil tests/Rocker arms; Rocker

**HS-008 907 Fld. 5/4****HEADLINERS - MOLDED FIBER-GLASS**

by G. A. Horton

Johns-Manville Corp., New York,  
J050001971 6p  
Report no. SAE-710067

Presented at Automotive Engineering Congress, Detroit, Mich., 11-15 Jan 1971.

The advantages and disadvantages of molded fiberglass headliners, their engineering benefits and limitations, and the features available to the stylist are discussed. Diagrams are included of the making of fiberglass and the manufacturing processes involved in molding, shaping, and trimming it. Types of glass and binders, and the future possibilities of this product are also discussed.

Search terms: Headliners /Fiberglass; Fiberglass /Manufacturing; Headliners /Design; Headliners /Molding

**AVAILABILITY: SAE****5/6 Fuel Systems****HS-008 908 Fld. 5/6****SMOG, NEW CARS, AND UNLEADED FUEL**

Anonymous

Published in *Air Force Driver* v4 n8 p10-3, 18

The internal combustion auto engine is the chief cause of photochemical smog. This problem in California, especially Los Angeles, has become a serious annoyance. The history of California's attempts to control smog is outlined, especially in regard to crankcase emissions, exhaust emissions, and evaporative losses. The influence of fuel quality and lead in the gasoline are discussed.

Search terms: Crankcase emissions /Smog; Exhaust emissions /Smog; Evaporative emissions /Smog; Smog /California; Smog /Los Angeles; Air pollution control /California; Air pollution emission factors /Smog; Air pollution emission factors/Internal combustion engines; Fuel quality /Smog; Leaded gasoline /Smog; Lead free gasoline

**AVAILABILITY: NTIS****HS-008 910 Fld. 5/6****EXHAUST EMISSIONS FROM WILLIAMS RESEARCH CORPORATION GAS TURBINE ENGINES. INTERIM REPORT**

by H. B. Moore

Williams Research Corp., Walled Lake, Mich., W18400

18 Jun 1970 92p 8 refs  
Contract CPA-22-69-84  
Report no. PB-193 479; WR-ER8

Rept. for 18 Jun 1969 - 19 Apr 1970.

**HS-008 909 Fld. 5/6****THE IMPLICATIONS OF LEAD REMOVAL FROM AUTOMOTIVE FUEL. AN INTERIM REPORT OF THE COMMERCE TECHNICAL ADVISORY BOARD PANEL ON AUTOMOTIVE FUELS AND AIR POLLUTION**Department of Commerce,  
Washington, D. C., D12600Jun 1970 37p  
Report no. PB-194 880

This report describes the effects of lead-containing fuel additives on emissions from gasoline-piston engines. Higher octane fuels enable more powerful and efficient engines to be built. The addition of lead alkyls is the least expensive way to increase the octane rating of motor fuel. However, these additives interfere with the development of exhaust treatment systems, especially those using catalysts. Lead salts in automobile exhaust tend to deactivate catalysts. Proposed 1975 emission standards call for a dramatic improvement. Six recommendations are made concerning federal regulation of fuel additives and federal requirements for unleaded gasoline.

Search terms: Lead alkyls /Fuel additives; Lead free gasoline /Federal control; Fuel additives /Federal control; Emission standards; Octane requirements /Fuel additives; Exhaust emission control devices; Catalysts /Fuel additives; Leaded gasoline

The exhaust emissions of several different models of gas turbine engines were measured. The emissions measured were carbon dioxide, carbon monoxide, unburned hydrocarbons, and the oxides of nitrogen. Results are presented in a generalized form relating emissions to fuel air ratio and engine power or thrust. Techniques were developed to convey exhaust samples from engines in test cells to analysis equipment elsewhere. Measurements were also made of the emissions from a gas turbine engine installed in a vehicle. Six conclusions are presented on the emission pattern of gas turbine engines and six recommendations are made for further study.

Search terms: Exhaust emission tests /Gas turbine engines; Unburned fuels /Exhaust emission tests; Carbon dioxide /Exhaust emission tests; Carbon monoxide /Exhaust emission tests; Hydrocarbons /Exhaust emission tests; Nitrogen oxides /Exhaust emission tests; Test equipment /Exhaust emission tests; Air fuel ratio /Exhaust emissions; Thrust /Exhaust emissions; Thrust /Gas turbine engines; Air fuel ratio /Gas turbine engines

**AVAILABILITY: NTIS**

**HS-008 911 Fld. 5/6****STUDY OF CONTINUOUS FLOW COMBUSTION SYSTEMS FOR EXTERNAL COMBUSTION VEHICLE POWERPLANTS**

by C. V. Burkland; W. B. Lee; G. Bahn; R. Carlson

Marquardt Corp., Van Nuys, Calif., M05800

Jun 1970 130p 22 refs  
Contract CPA-22-69-128  
Report no. PB-193 417

The purpose of this study was to develop design criteria for the combustor of a continuous flow combustion system with low emission of air pollutants. The pollutants of interest were carbon monoxide, unburned hydrocarbons, oxides of nitrogen, and particulate matter. In addition to low emissions, it was desired that the combustion system have a high heat release per unit volume and be capable of being modulated over a range of heat releases corresponding to engine power settings from idle to full throttle. Those external combustor variables which were considered to have a major effect on air pollutant emission were studied, including fuel type, fuel preparation prior to injection, fuel-air ratio, fuel-air mixing, combustor staging, and residence time of the gases in the combustor.

**Search terms:** Air pollution emission factors /External combustion engines; Carbon monoxide/Air pollutants; Unburned fuels /Air pollutants; Hydrocarbons /Air pollutants; Nitrogen oxides /Air pollutants; Particulate air pollutants; Air fuel ratio /Exhaust emissions; Fuel injection /Exhaust emissions; Fuel composition /Exhaust emissions; Fuel mixtures /Exhaust emissions; Combustion /Air pollution emission factors; Idling /Engine operating conditions; Throttling /Engine operating conditions; Heat /Engine operating conditions

AVAILABILITY: NTIS

**HS-008 912 Fld. 5/6****APPLICATION OF CATALYSTS TO AUTOMOTIVE NO<sub>X</sub> EMISSIONS CONTROL**

by L. S. Bernstein; K. K. Kearby; A. K. S. Raman; J. Vardi; E. E. Wigg

Standard Oil Co. (New Jersey), New York, S36580

1971 18p 10 refs  
Report no. SAE-710014

Presented at Automotive Engineering Congress, Detroit, Mich., 11-15 Jan 1971.

Nickel-copper alloys, marketed under the name Monel, have been found to be extremely active NO<sub>x</sub> reduction catalysts. At temperatures above 1300F and under net reducing conditions, Monel will catalyze the removal of 90% or more of the NO in automotive exhaust. On unleaded fuel, Monel catalysts have shown good chemical activity for as long as 31,000 miles. Catalyst life is limited to approximately 10,000 miles by physical deterioration of the catalyst, which causes increases in exhaust back pressure. The presence of lead in the fuel substantially increases the rate of Monel deterioration.

**Search terms:** Exhaust emission control devices /Catalytic converters; Air fuel ratio; Dual bed catalyst systems /Lead free gasoline; Dual bed catalyst systems /Leaded gasoline; Exhaust emission control devices /Nickel copper alloys; Nitric oxide /Reduction (chemistry); Exhaust emission control devices /Heat; Monel /Exhaust emission tests; Dual bed catalyst systems /Performance characteristics

AVAILABILITY: SAE

**HS-008 913 Fld. 5/6****A FIELD SURVEY TO DETERMINE PUBLIC OPINION OF DIESEL ENGINE EXHAUST ODOR. FINAL REPORT**

by Karl J. Springer; Charles T. Hare

Southwest Research Inst., San Antonio, Tex., S31800

Feb 1970 168p 8 refs  
Contract PH-22-68-36  
Report no. AR-718; PB-191 529

A workable method of sampling public opinion of diesel exhaust odor has been conceived and employed. The method involved use of a calibrated mobile odor evaluation laboratory. Opinions on a series of three levels of diesel odor have been obtained from 3,039 persons whose backgrounds, ages, and places of residence are well distributed with respect to the total urban population. Survey data have been analyzed, results are presented, eight conclusions are drawn, and five recommendations are made.

**Search terms:** Diesel engine exhaust emissions /Odors; Exhaust odors /Public opinion; Exhaust odors /Diesel engines

AVAILABILITY: NTIS

**HS-008 914 Fld. 5/6****USE OF LEAD-FREE GASOLINE CAN PRESENT SERIOUS PROBLEMS**

by Arthur E. Felt; Robert V. Kerley

Published in *SAE Journal of Automotive Engineering* v79 n3 p54-6 (Mar 1971)

The consequences of leaving the lead out of gasoline can include an increase in engine octane-number requirements and the emission of more of the undesirable pollutants. The removal of lead antiknocks results in chemical effects on the composition of the exhaust gases. The aldehyde content is increased. The smog forming reactivity of exhaust is also increased, and emissions of polynuclear aromatics and phenols are greater.

**Search terms:** Lead free gasoline /Exhaust emissions; Exhaust gases /Chemical reactions;

**5/6 Fuel Systems (Cont'd.)**

HS-008 914 (Cont'd.)

Aldehydes /Exhaust emissions; Phenols /Exhaust emissions; Aromatic compounds /Exhaust emissions; Smog /Exhaust emissions; Octane requirements /Lead free gasoline

HS-008 915 Fld. 5/6

**INVESTIGATION OF A SUBSTITUTE FUEL TO CONTROL AUTOMOTIVE AIR POLLUTION. FINAL REPORT**

by R. E. Fitch; J. D. Kilgroe

Consolidated Engineering Technology Corp., Mountain View, Calif., C63350

Feb 1970 79p 8 refs  
Contract CPA-22-69-70  
Report no. CETEC-01800-FR; PB-194 688

A study was conducted to investigate the feasibility of using methanol as a substitute for gasoline to reduce exhaust pollutants emitted from automotive engines. Work was performed in two phases encompassing both automotive and single cylinder laboratory engine tests. Methanol displays significant potential as a pollution control substitute for gasoline. It was satisfactory from the standpoint of engine operation and produced low methanol emissions. Vehicle mileage was low, as expected. Suspected high aldehyde emissions were confirmed. It is, however, believed that optimization of the fuel-air ratio, the mixture distribution to the cylinders, and heating of the fuel or fuel-air mixture will result in improved performance and substantial reduction of most emissions.

Search terms: Methanols /Fuels; Methanols /Exhaust emissions; Engine operating conditions /Fuel properties; Air fuel ratio /Exhaust emissions; Fuel mixtures /Exhaust emissions; Vehicle

mileage /Methanols; Cylinders /Fuel mixtures; Fuel mixtures /Heating; Engine tests /Laboratory tests; Engine tests /Automobile engines; Aldehydes /Exhaust emissions

**AVAILABILITY: NTIS****5/7 Glazing Materials**

HS-008 916 Fld. 5/7

**COMPOSITION AND REMOVAL OF AUTOMOBILE WINDSHIELD FILMS. FINAL REPORT**

by Rodger W. Plaster; Michael A. Ozol

Virginia. Highway Research Council, Charlottesville, V12000

Jun 1970 26p 13 refs

In order to alleviate the problem of impaired visibility caused by windshield films, the origin and nature of dirt-forming windshield films and the most effective methods of removing them were investigated. The composition of the film materials, both organic and inorganic, was investigated by infrared spectrophotometry, X-ray diffractometry, and binocular and petrographic microscopy. Samples for analysis were collected from windshields and pavement surfaces. Cleaning agents and procedures were tested in the laboratory. It was concluded that materials causing film during the early stages of a rain are splashed up from the road surface and that alcohol-detergent cleaning agents are more effective than other types. The composition of the film materials is also discussed.

Search terms: Windshield dirt accumulation /Reduced visibility; Windshield dirt accumulation /Cleaning; Detergents /Laboratory tests; Alcohols /Detergents; Splash /Windshield dirt accumulation; Spectrophotometry /Windshield research; Microscopes /Windshield research; X-ray diffraction /Windshield research

HS-008 917 Fld. 5/7; 3/12

**CONSEQUENCES OF TINTING IN AIRCRAFT WINDSHIELDS**

by B. A. J. Clark

Australia. Dept. of Civil Aviation, Melbourne, Vic. Aviation Medicine Branch, A75950

Feb 1970 52p 135 refs  
Report no. Aviation-Medi-cine-Memo-26

An examination is made of some current types of aircraft windshield materials that reduce the amount of external light available to the pilot. The relevant technical literature is surveyed to find what effects this light reduction could have on pilots' vision. From this survey, it is concluded that any tinting is undesirable, and appropriate recommendations are made for the spectral-transmissive properties of windshields and other windows used by flight crews. Auxiliary light reducing devices such as visors and sunglasses are also discussed. The effects of windshield tinting in daylight, twilight, and night conditions are discussed separately.

Search terms: Tinted windshields /Night vision; Tinted windshields /Twilight vision; Tinted windshields /Reduced visibility; Tinted windshields /Reviews; Sunglasses /Reduced visibility; Sun visors /Reduced visibility; Pilot aircraft interface /Visibility; Windows /Visibility

**5/10 Lighting Systems**

HS-008 918 Fld. 5/10

**THE USE OF HEADLIGHTS IN LIGHTED STREETS**

by L. Cooper

England. Road Research Lab., Crowthorne, Berks., E14400

1970 38p 5 refs  
Report no. RRL-LR-368

Vehicle lighting counts at 38 sites in 7 cities show that the percentage of drivers using headlights or other lights in addition to sidelights varies considerably. Counts were made both morning and evening several weeks before and repeated several weeks after January 1, 1969, when new headlamp regulations came into operation. Usage varied greatly between cities with poor street lighting, cities with medium street lighting, and cities with good street lighting. There was no appreciable difference in headlamp usage between that of 1968 and that of 1969.

Search terms: Headlamp daytime usage /Great Britain; Headlamp usage /Great Britain; Headlamp usage /Street lighting; Headlamp daytime usage /Street lighting; Headlamp regulations /Great Britain

AVAILABILITY: NTIS

### 5/11 Maintenance and Repairs

#### HS-008 919 Fld. 5/11

DIAGNOSING ENGINE TROUBLE TAKES INSTRUMENTATION AND SHARP EYES

by N. E. Cafarelli; N. J. Musil; James C. Kolbe

Published in *Automotive Engineering* 78 n8 p38-41 (Aug 1970)

While a good mechanic needs instruments to analyze an engine, he can also learn a great deal through visual inspection. A close look at a torn-down engine will reveal signs of failures. Steps for conducting a visual engine inspection are outlined.

Search terms: Engine inspection /Inspection procedures; Engine inspection /Inspection equipment; Mechanics (personnel) /Engine inspection; Engine failures /Engine inspection

#### HS-008 920 Fld. 5/11

### AUTOMOTIVE MECHANIC ENTRY. A SUGGESTED GUIDE FOR A TRAINING COURSE

Office of Education, Washington, D.C.Q02070

1969 26p 17 refs  
Report no. OE-87041

This training guide has been prepared to assist in course development by school administration personnel who may not be specialists in the automotive field. It is intended primarily for use by the Manpower Development and Training Program but includes instructional material that will help the trainees to develop and advance beyond the basic skill requirement for job application. It is to meet D.O.T. Occupational Code 620.281, Automobile Mechanic, Entry. The course is divided into 14 units, and hours of classroom and laboratory instruction are suggested. A list of machines, tools, equipment, supplies, textbooks, films, and a floor plan for the training facility are included.

Search terms: Mechanic training /Instruction manuals; Mechanics (personnel) /Manpower utilization; Mechanic training /Instruction materials

AVAILABILITY: GPO \$0.35

### 5/14 Occupant Protection

#### HS-008 921 Fld. 5/14

CARS WILL BE SAFER - IF THIS IDEA WORKS. HERE'S THE LOWDOWN ON THE FIGHT OVER "AIR BAGS"

Anonymous

Published in *Changing Times* p31-3 (Nov 1970)

The advantages and disadvantages of air bags for occupant protection are

discussed. The Department of Transportation may require air bags in cars built after January 1, 1973, and the automotive industry insists that more time is needed to work out the engineering and safety problems. Air bag protection in frontal, side impact, and rollover accidents is discussed.

Search terms: Air bag restraint systems; Rollover accidents /Air bag restraint systems; Side impact collisions /Air bag restraint systems; Front end collisions /Air bag restraint systems; Automotive industry /Lead time; Safety standards /Air bag restraint systems

#### HS-008 922 Fld. 5/14

### SAFETY BELTS: THEIR FITTING AND USE. ENQUIRY 1968/1969 AMONG ROAD-USERS ON ROADS OUTSIDE BUILT-UP AREAS

by Th. P. M. de Grefte; H. G. Paar

Stichting Wetenschappelijk Onderzoek Verkeersveiligheid, Voorburg (Netherlands), S45000

1970 43p  
Report no. 1970-2

Outside built-up areas in the Netherlands, 22% of the passenger cars surveyed had safety belts. Of these, 39% were actually being used; hence only 8.5% of drivers interviewed used safety belts. The diagonal belt is used least, the lap belt is used more, and the three point belt is used more than either. Men use belts more than women do, and younger drivers less than other drivers. Design and convenience of the belts have some effect on their usage.

Search terms: Seat belt design /Seat belt usage; Seat belt usage /Netherlands; Shoulder harness usage /Netherlands; Three point restraint system usage /Netherlands; Restraint system usage /Male drivers; Restraint system usage /Female drivers; Restraint system usage /Age factors

HS-008 923 Fld. 5/14

**PATHOLOGY OF TRAUMA ATTRIBUTED TO RESTRAINT SYSTEMS IN CRASH IMPACTS**

by Richard G. Snyder; Clyde C. Snow; Joseph W. Young; Warren M. Crosby; G. Townley Price

Federal Aviation Administration, Oklahoma City, Okla., F03900

Feb 1969 36p 84 refs  
Report no. AM-69-3; AD-695 415

This paper, as published in *Aerospace Medicine* v39 n8 p812-29 (1968), was previously announced in HSL as HS-004 190.

The types and severity of injuries attributed to lap belt, 3-point harness, single diagonal belt, double-torso harness, experimental double-torso inverted-Y yoke with inertia reel, and air bag restraint system have been assessed. Physical impact patterns typical of jet aircraft crashes, light aircraft crashes, and automotive impacts were studied. The study included 60 experiments with baboons and series of tests to determine effects of seat belts on the pregnant baboon and fetus. It is concluded that while restraint systems may protect occupants from serious trauma, the system itself may cause lesser but significant injury. Intensive research should be conducted on restraint caused injuries, referred to as tertiary collision injuries.

Search terms: Injury causes /Restraint systems; Impact caused injuries /Restraint systems; Injury causes /Shoulder harnesses; Injury causes /Three point restraint systems; Injury causes /Air bag restraint systems; Fetal death /Restraint systems; Impact tests /Restraint systems; Baboons /Impact caused injuries; Seat belt caused injuries

AVAILABILITY: NTIS

5/15 Propulsion Systems

HS-008 924 Fld. 5/15

**BACK TO STEAM POWER?**

by Karl Ludvigsen

Published in *Motor* (London) n3573 p20-4 (26 Dec 1970)

The development of the Lear steam engine for automobiles is described. Design of the engine and its low emission pattern are discussed. Cooperation between Lear and General Motors is in progress.

Search terms: Lear steam automobiles /Engine design; Steam engines /Emissions; Steam automobiles /General Motors Corp.

HS-008 925 Fld. 5/15

**EXCLUSIVE - A SIMPLE SYSTEM PROMISES AN END TO POLLUTION!**

by Paul Van Valkenburgh

Published in *Sports Car Graphic* v10 n12 p48-50 (Dec 1970)

The possibility of a spring-powered car working on the principle of mechanical storage of energy is discussed. A group of aerospace engineers in Los Angeles has worked out a design for such a car, which would be a radical breakthrough in technology. Details of the propulsion system are not yet available, but emissions would be zero. The laboratory and records were destroyed in a fire recently, so the development of this car will be delayed.

Search terms: Mechanical energy storage /Propulsion systems; Air pollution emission factors; Springs /Propulsion systems; Automobiles design /Experimental automobiles

5/18 Steering Control System

HS-008 926 Fld. 5/18

**THE AUTOMATIC STEERING OF VEHICLES - AN EXPERIMENTAL SYSTEM FITTED TO A DS 19 CITROEN CAR**

by K. H. F. Cardew

England. Road Research Lab., Crowthorne, Berks., E14400

1970 30p 5 refs  
Report no. RRL-LR-340

A car has been equipped with an experimental automatic steering system to study the feasibility of automatic vehicle control. The car was chosen for its high pressure hydraulic system. The car is capable of following a buried cable, and an electrohydraulic servomechanism has been installed to steer the front wheels. Speeds up to 80 mph were obtained on dry surfaces and up to 60 mph on snow covered surfaces without loss of control. Development work was directed to preventing the car from "hunting" over the cable and to improving lateral ride. Details of the servo and sensing systems and of modifications to the vehicle are described.

Search terms: Automatic steering control /Dry road conditions; Automatic steering control /Wet road conditions; Automatic steering control /Cable guides; Automatic steering control /Vehicle riding qualities; Automatic steering control /Speed; Hydraulic equipment /Automatic steering control; Servomechanisms /Automatic steering control; Front wheels /Automatic steering control

AVAILABILITY: NTIS

5/19 Theft Protection

HS-008 927 Fld. 5/19; 5/18

**VERIFICATION TESTING OF THE 1970 ANTI-THEFT STEERING COLUMN**

by J. Forgione

Ford Motor Co., Dearborn, Mich., F18600

Published in *Annals of Reliability and Maintainability*, Vol. 9, Assurance Technology Spinoffs (P-32), New York, 1970, p82-95

5 refs

Report no. SAE-700582

Presented at Reliability and Maintainability Conference (9th), Detroit, Mich., 20-22 Jul 1970.

Key elements are outlined for a laboratory reliability verification test program for an automotive sub-system. By means of an actual case study, verification testing of the anti-theft steering column, steps required to design tests which yield meaningful information and the rationale used to analyze the results are presented. The steering column on a late model auto is a complex system which combines several functions and features: steering, shifting, warning devices, ignition switch, anti-theft devices, plus several safety features. The effectiveness of the overall verification program is evaluated through the presentation of actual field-feedback results.

Search terms: Theft prevention devices /Steering column locks; Steering column locks /Reliability; Steering column locks /Performance tests; Steering systems /Reliability; Steering systems /Performance tests; Steering column locks /Laboratory tests; Warning systems /Steering columns; Ignition systems /Steering columns; Shift levers /Steering columns; Safety devices /Steering columns

AVAILABILITY: SAE

## 5/20 Trucks and Trailers

HS-008 928 Fld. 5/20

ELASTOMERS ASSUME MAIN ROLE IN TRUCK AND TRAILER SUSPENSIONS

by William Flanagan

Published in *Automotive Engineering* v78 n12 p34-7 (Dec 1970)

No longer limited to secondary use for isolators, rubber is becoming more popular as the main spring element due to advantages of inherent damping and variable spring rates. The properties and advantages of rubber springs are described.

Search terms: Suspension systems /Trucks; Suspension systems /Trailers; Spring damping; Spring rates; Springs /Performance characteristics; Rubber /Springs

## 5/22 Wheel Systems

H S-008 929 Fld. 5/22

### TIRE CORD: THE BATTLE OF THE INORGANICS

by Joseph V. Del Gatto

Published in *Rubber World* v163 n2 p47-51 (Nov 1970)

Steel and glass fibers are destined for a crucial confrontation in the reinforcement marketplace. The payoff depends on technological advances that can strongly influence price structures. The performance characteristics of steel fibers for tires are discussed. Glass fibers are briefly discussed. Development plans of various manufacturers for these fibers are described.

Search terms: Tire cords /Steel tires; Tire cords /Glass belted tires; Tire industry; Tire manufacture; Tire cords /Performance characteristics; Steel tires /Performance characteristics; Glass belted tires /Performance characteristics

HS-008 930 Fld. 5/22

GLASS FIBER REINFORCED PLASTIC TIRES FOR THE MARGINAL TERRAIN VEHICLE. FINAL REPORT

by James C. Hood

Owens-Corning Fiberglas Corp., Toledo, Ohio, 021000

Apr 1969 29p  
Contract DAAE-07-67-C-3853  
Report no. AD-689 503

The program objective was to develop and fabricate glass fiber reinforced plastic tires for use on the marginal terrain vehicle. These tires were to have been non-pneumatic, hence to have provided a tire with capability of operating after damage. Several configurations of tire were fabricated for testing. None was found that yielded a tire with load/deflection characteristics that compared favorably with rubber pneumatic tires nor that would support appropriate loads without carcass failure. In general terms, the problem is that a shell of double curvature made of a stiff material will not take a large deflection without buckling.

Search terms: Glass fiber reinforced plastics /Tire materials; Glass fiber reinforced plastics /Performance characteristics; Tire materials /Military vehicles; Tire materials /Off the road vehicles; Tire failures /Tire tests; Tire tests /Tire materials; Tire loads /Glass fiber reinforced plastics; Tire deflection /Glass fiber reinforced plastics

AVAILABILITY: NTIS

HS-008 931 Fld. 5/22

### LIFE OR DEATH FOR STUDED TIRES?

Anonymous

Published in *Modern Tire Dealer* v52 n5 p29-33 (Dec 1970)

Although studded tires used on slippery winter roads improve vehicle stopping distances dramatically, they also speed up road surface

**5/22 Wheel Systems (Cont'd.)**  
**HS-008 931 (Cont'd.)**

deterioration. Seven states are making a joint study on tire stud road wear and may outlaw their use, as has already been done in Ontario. Spokesmen for various tire stud manufacturers are quoted in defense of their product.

Search terms: Tire studs /Pavement damage; Stopping distance/Tire studs; Winter driving /Studded tires; Icy road conditions/Studded tires; Stopping distance /Studded tires; Tire studs /Legal aspects

**NHTSA DOCUMENTS**

**NHTSA Accident Investigation Reports**

**HS-800 431 Fld. 1/2**

**ACCIDENT PATHOLOGY. PROCEEDINGS OF AN INTERNATIONAL CONFERENCE, WASHINGTON, D. C., JUNE 6-8, 1968**

by K. M. Brinkhous, ed.

Universities Associated for Research and Education in Pathology, Inc., Bethesda, Md., U08100

1968 259p 509 refs  
 Contract FH-11-6595

**HS-800 432 Fld. 1/2**

**THE CHANGING APPROACH TO THE EPIDEMIOLOGY, PREVENTION, AND AMELIORATION OF TRAUMA: THE TRANSITION TO APPROACHES ETIOLOGICALLY RATHER THAN DESCRIPTIVELY BASED**

by William Haddon, Jr.

National Highway Safety Bureau, Washington, D. C., N18000

Published in *Accident Pathology. Proceedings of an International Conference, 1968* p2-7

6 refs

Presented at an international conference held in Washington, D.C. 6-8 Jun 1968.

**HS-008 932 Fld. 5/22**

**WHY THE NEW TIRES ARE DIFFERENT**

by Arthur Perrow

Published in *Motor* (New York) v134 n5 p48-9, 97-8 (Nov 1970)

Assign, construction, and material changes have made the job of proper tire selection for customers very confusing. Three basic types of tires are available for passenger cars: the conventional bias ply cord tire, the belted bias ply carcass tire, and the urethane belted radial tire. Advantages and disadvantages of each are discussed. A tire size conversion chart is given, and the characteristics of sidewalls are explained.

Search terms: Bias belted tires /Performance characteristics; Bias tires /Performance characteristics; Radial tires /Performance characteristics; Tire sizes; Tire cords; Tire characteristics; Tire materials; Tire selection

This conference was organized in cooperation with Armed Forces Institute of Pathology and National Highway Safety Bureau.

Papers on the following aspects of accident pathology were presented: epidemiology; biomechanics; drugs and chemicals; thrombotic complications; head and neck injuries; chest and abdomen injuries; forensic medicine; and autopsy reporting.

Search terms: Accident investigation /Pathology; Accident investigation /Epidemiology; Injury research /Biomechanics; Accident research /Alcohol; Accident research /Carbon monoxide; Thrombosis /Injury research; Head injuries /Accident research; Neck injuries /Accident research; Chest injuries /Accident research; Abdominal injuries /Accident research; Forensic medicine /Accident research; Autopsies /Accident research; Autopsies /Medical case reports

Epidemiology and etiology of trauma especially on the highway is discussed using medical examples. The concept of "accident" is explained in this context. A phase-component matrix for identifying major areas within the highway portion of the overall chemical and physical injury problem is presented. The phases are: precrash, crash, and postcrash.

Search terms: Injuries /Etiology; Injuries /Epidemiology; Traffic accidents /Injuries; Traffic accidents /Damage; Damage /Etiology; Pre crash phase; Crash phase; Postcrash phase

AVAILABILITY: In HS-800 431

**HS-800 433 Fld. 1/2**

**BEGINNINGS OF CRASH INJURY RESEARCH**

by Hugh DeHaven

Published in *Accident Pathology. Proceedings of an International Conference, 1968* p8-11

Presented at an international

AVAILABILITY: Includes HS-800 432 to HS-800 458; GPO \$4.75

conference held in Washington, D.C., 6-8 Jun 1968.

A brief history of crash injury research is presented. Aviation aspects and a head injury study conducted at Bellevue are discussed. The project had its beginning in World War II and was headquartered at Cornell Medical College.

Search terms: Injury research /History

AVAILABILITY: In HS-800 431

HS-800 434 Fld. 1/2

#### AUTOMOBILE-ACCIDENT INJURIES AND ACCIDENT PATHOLOGY

by Alan M. Nahum; Irving I. Lasky; Thomas T. Noguchi

California Univ., Los Angeles. School of Medicine, C21600

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p14-25

5 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

The traffic accident studies conducted by a medical-engineering team at UCLA are described and two case reports are presented. The pathology of injury causation and the implications on prevention are emphasized. The value of experimental studies is noted as is in the use of cadaver tissue for these studies. Distributions of pedestrian fatalities and driver fatalities related to blood alcohol levels is provided. Injury distributions for drivers, passengers, and pedestrians also is provided.

Search terms: Accident investigation /Multidisciplinary teams; Medical case reports; Accident investigation /Pathology; Injury cases; Injury prevention;

Injury case reports; Injury research /Laboratory animals; Injury research /Cadavers; Cadavers in testing; Pedestrian fatalities /Injury statistics; Driver fatalities /Injury statistics; Passenger fatalities /Injury statistics; Pedestrian fatalities /Blood alcohol levels; Driver fatalities /Blood alcohol levels

AVAILABILITY: In HS-800 431

HS-800 435 Fld. 1/2

#### RECONSTRUCTION OF ACCIDENTS: INTEGRATION OF PATHOLOGIC AND ROADSIDE EVIDENCE

by Werner U. Spitz

Maryland Medical-Legal Foundation, Inc., Baltimore, M99600; Maryland Dept. of Post Mortem Examiners, Baltimore, M97200

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p26-35

11 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Forensic medicine in investigating accidents involving pedestrians, drivers, and passengers is emphasized. Although the importance of the examination of vehicles that were involved in fatal traffic accidents by the pathologist performing the autopsy is generally recognized, such examinations are rare. An adequate investigation of a traffic death is never complete without examination of the vehicle involved. A case report uncovering homicide is presented as an example.

Search terms: Accident investigation /Forensic medicine; Deformation /Forensic medicine; Medical case reports; Homicide by vehicle /Injury causes; Injury causes /Pathology; Autopsies /Injury

causes; Homicide /Accident investigation; Injury case reports

AVAILABILITY: In HS-800 431

HS-800 436 Fld. 1/2

#### ROADSIDE INVESTIGATIONS OF TRAFFIC-ACCIDENT INJURIES

Paul W. Gikas; Donald F. Huelke

Michigan Univ., Ann Arbor, M36600

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p36-41

9 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Types of information that can be gained from careful investigation of an automobile accident are presented in six case reports. This information can be helpful in determining the pathogenesis of injuries and in pointing out obvious hazards in automobiles and roadways and the need for their modification. Correlation of the injury pattern with the damage pattern may also help to identify the driver in a particular accident when this information is otherwise not available. Such information can be of help in prosecution or civil litigation. It can be learned from the details of an incident that it was not an accident but an intentional act.

Search terms: Accident investigation /Forensic medicine; Injury causes /Pathology; Deformation /Injury causes; Medical case reports; Injury case reports; Culverts /Skull fractures; Ejection /Skull fractures; Instrument panel caused injuries; Instrument panels /Pharyngeal injuries; Brain injuries /Headers; Header caused injuries; Brain injuries /Instrument panels; Steering wheel caused injuries; Steering systems /Chest injuries; Steering systems /Heart injuries; Steering control rearward

**NHTSA Accident Investigation Reports (Cont'd.)****HS-800 436 (Cont'd.)**

displacement /Multiple injuries; Accident causes /Suicide; Suicide by vehicle; Driver identification in accidents

**AVAILABILITY:** In HS-800 431

**HS-800 437 Fld. 1/2****VEHICULAR SUICIDE**

by John F. Edland

Missouri Univ., Columbia. School of Medicine, M52200

Published in *Accident Pathology, Proceedings of an International Conference*, 1968 p42-45

19 refs.

Presented at an international conference held in Washington, D. C. 6-8 Jun 1968.

A review of literature on suicide especially related to the vehicle as the instrument is presented. Inadequacies including legal aspects of the present classification of traffic fatalities are presented. It is recommended that the present system - natural, accident, suicide, homicide - be changed to intentional, subintentional, unintentional. Responsibilities of medical examiners, coroners, and forensic pathologists are emphasized. The role of alcohol in vehicular suicide is discussed.

Search terms: Suicide by vehicle; Suicide / Reviews; Fatalities /Classification; Classification /Legal factors; Forensic medicine; Pathology; Coroners; Alcoholism/Suicide by vehicle; Fatality causes/Legal factors

**AVAILABILITY:** In HS-800 431

**HS-800 438 Fld. 1/2****PEDIATRIC INJURIES**

by Bertil Aldman; Jan Thorson

Sweden. Statens Trafiksakerhetsråd, Stockholm, S58200

Published in *Accident Pathology, Proceedings of an International Conference*, 1968 p46-9

Presented at an international conference held in Washington, D.C. 6-8 Jun 1968.

This presentation describes briefly two samples of injured children. One consists of nonfatal cases who received treatment as in-patients at hospitals in one region of Sweden and were discharged during 1965. The other consists of fatal cases involving children in Sweden during one year in the mid-1960s. Data for road users is tabulated by type of user, fatal, nonfatal, and type of injury. Statistics for all types of accidents are broken down by age.

Search terms: Child injuries /Statistics; Child injuries/Fatalities; Bicycle rider injuries /Children; Bicycle rider fatalities /Children; Motorcycle operator injuries /Children; Motorcycle operator fatalities /Children; Pedestrian injuries /Children; Pedestrian fatalities /Children; Passenger fatalities /Children; Passenger injuries /Children

**AVAILABILITY:** In HS-800 431

**HS-800 439 Fld. 1/2****THE EPIDEMIOLOGY OF AUTOMOBILE ACCIDENTS IN THE UNITED STATES**

by Ross A. McFarland

Harvard School of Public Health; Boston, Mass., H04800

Published in *Accident Pathology*.

*Proceedings of an International Conference*, 1968 p52-62

30 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

This brief review of the epidemiological findings of automobile injuries and fatalities is presented to illustrate that this method of analysis offers promise for highlighting many major problems. Figures are given for the vehicle population and the licensed driver population in the United States. Such driver characteristics as: age; sex; driver education; emotional factors; alcohol; and medical conditions are investigated. The highway and the vehicle also are studied in the epidemiology of accidents.

Search terms: Automobile accidents/Epidemiology; Accident research/United States; Accident research/Driver characteristics; Accident research/Driver age; Accident research/Driver sex; Accident research/Driver personality; Accident research/Driver physical fitness; Accident research/Drinking drivers; Accident research/Highway design; Accident research/Vehicle design; Driver education/Accident research

**AVAILABILITY:** In HS-800431

**HS-800 440 Fld. 1/2****EPIDEMIOLOGY OF TRAUMA IN EUROPE**

by Eberhard Gogler

Published in *Accident Pathology, Proceedings of an International Conference*, 1968 p63-6

Presented at an international conference held in Washington, D. C., 6-8 Jun 1968.

This report on the epidemiology of injury includes figures on traffic accidents. The majority of the statistics is provided by the

University of Heidelberg, but data from Germany as a whole and other countries are presented.

Search terms: Injuries /Epidemiology; Traffic accidents /Injuries; Traffic accidents /Germany; Traffic accidents /Heidelberg; Fatalities

AVAILABILITY: *In HS-800 431*

HS-800 441 Fld. 1/2

#### PATHOMECHANICS OF AUTOMOTIVE RESTRAINT-SYSTEM INJURIES

by Richard G. Snyder; J. W. Young; G. Townley Price

Ford Motor Co., Dearborn, Mich., F18600; Federal Aviation Administration, Oklahoma City, Okla., F03900

Published in *Accident Pathology, International Conference*, 1968 p68-89

83 refs

Presented at an international conference held in Washington, D. C., 6-8 Jun 1968.

Deceleration test results for restraint systems and seat positions are reported. Baboons were used as subjects. Seat positions included front facing, side facing, and rear facing. Systems tested were: lap belts; diagonal belts, three point, full torso, inverted Y yoke double shoulder harness, and air bag. Deceleration tolerance was lowest for side facing seats. Gravé effects that may not be correlated with degree of tissue disruption are reported, fetal death and pancreatic involvement being cited. Evidence indicates that loose-high lap belts contribute to more severe injuries than those snugly fitted and worn over the abdomen. The two experimental devices, Y yoke with inertia reel and the air bag, gave maximal protection to the occupant.

Search terms: Restraint system effectiveness; Restraint

systems /Injuries; Deceleration tests /Baboons; Seat positioning/Deceleration tests; Seat positioning /Injuries; Seat belts /Injuries; Seat belt caused injuries; Shoulder harnesses /Injuries; Three point restraint systems /Injuries; Air bag restraint systems /Injuries; Fetal death /Deceleration tests; Pancreatic injuries /Deceleration tests

AVAILABILITY: *In HS-800 431*

HS-800 442 Fld. 1/2

#### THE BIOLOGIC AND PATHOLOGIC EFFECTS OF BLAST INJURY

by Thomas L. Chiffelle; Robert K. Jones; Donald R. Richardson; Edward G. Damon

Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., L22400

Published in *Accident Pathology, Proceedings of an International Conference*, 1968 p90-106

51 refs

Presented at an international conference held in Washington, D. C., 6-8 Jun 1968.

The effects of various patterns of explosive overpressure on thirteen species of animals is reported together with a review of the literature on the subject. The properties and characteristics of explosive forces was discussed in terms of the explosive overpressure which may result from air bag restraints in an automobile

Search terms: Explosions /Laboratory animals; Explosions /Reviews; Air bag restraint systems /Explosions

AVAILABILITY: *In HS-800 431*

HS-800 443 Fld. 1/2

#### STUDY OF MECHANICAL PROPERTIES OF THE HUMAN CALVERIUM

by Verne L. Roberts; John Melvin

Michigan Univ., Ann Arbor, Highway Safety Research Inst., M40800

Published in *Accident Pathology, Proceedings of an International Conference*, 1968 p107-113

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Research methods for the study of tension, compression, and shear on the bones of the skull are reported.

Search terms: Skull /Tension tests; Skull /Compression tests; Skull /Shear stress; Research methods /Stress (Mechanics)

AVAILABILITY: *In HS-800 431*

HS-800 444 Fld. 1/2

#### STRESS ANALYSIS OF INDIVIDUAL TISSUES

by Hiroshi Yamada

Kyoto Prefectural Univ. of Medicine (Japan), K11400

Published in *Accident Pathology, Proceedings of an International Conference*, 1968 p114-6

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

The effect of age related changes in the strength of various organs and tissues is presented. That such changes are closely related to the tissue effects of physical accidents is noted.

Search terms: Human tissue mechanical properties /Strength (mechanical); Human tissues /Aging; Human body /Aging; Research methods /Human tissue mechanical properties

AVAILABILITY: *In HS-800 431*

**HS-800 445 Fld. 1/2****ALCOHOL AND ACCIDENTS**

by Donald Teare

Saint George's Hospital, London  
(England), S02100Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p118-20

10 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

British laws regarding tissue alcohol levels and traffic accidents are discussed. Accidental alcohol deaths other than traffic are noted. Figures are given which make it appear that the effects of alcohol and barbiturates are additive.

Search terms: Blood alcohol levels; Alcohol laws /Great Britain; Urine alcohol levels; Alcohol breath tests; Intoxication /Fatalities; Barbiturates /Fatalities; Synergism

AVAILABILITY: In HS-800 431

**HS-800 446 Fld. 1/2****CARBON MONOXIDE AND ACCIDENTS**

by Pierre A. Finck

Armed Forces Inst. of Pathology, Washington, D.C., A59400

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p121-124

19 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Some data on the causes of carbon monoxide poisoning in various environments, effects of various

concentrations, methods of analysis, distinctive findings in specimens from victims' bodies, and methods of prevention of CO Poisoning have been presented. The proof of exposure to CO depends on the valid analysis of the blood or of an air sample taken in the environment of the victim. Anatomic lesions are not specific.

Search terms: Carbon monoxide poisoning; Carbon monoxide /Traffic accidents; Carbon monoxide indicators; Carbon monoxide /Pathology; Carbon monoxide /Air sampling; Carbon monoxide /Blood analysis

AVAILABILITY: In HS-800 431

**HS-800 447 Fld. 1/2****SOME MECHANISMS OF THROMBUS FORMATION AND HEMORRHAGE FOLLOWING TRAUMA**

by K. M. Brinkhous

North Carolina Univ., Chapel Hill, N65700

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p126-30

15 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Thrombosis and hemorrhage are common complications of trauma. The thrombotic lesions appear to be mediated through the mechanism of platelet aggregation and fibrin deposition. The diffuse hemorrhagic lesions appear to be mediated by thromboplastin release into the blood stream. The anticoagulants, heparin and dicumarol, appear to be valuable in preventing continued diffuse clotting.

Search terms: Injuries /Hemorrhage; Hemorrhage /Biochemistry; Anticoagulants /Biochemistry;

Thrombosis /Injuries; Thrombosis /Biochemistry

AVAILABILITY: In HS-800 431

**HS-800 448 Fld. 1/2****THROMBOSIS AFTER INJURY INCLUDING PULMONARY MACROEMBOLISM AND MICROEMBOLISM**

by Simon Sevitt

Birmingham Accident Hospital and Rehabilitation Centre, Warwick (England), B15400

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p131-8

29 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Large thromboemboli in the lungs are well recognized as a common cause of illness and death after trauma. Embolism in patients with fractures especially of hip and tibia is familiar to surgeons although its frequency is underestimated clinically. Microscopic thrombi in the lungs occur after injury and burns. Morphologically two kinds can be distinguished, arterial and capillary. Age and survival period have a big influence on the frequency of thrombosis. The incidence of thrombosis was particularly high in middle-aged and elderly patients at bedrest for longer than three days, and was much lower in those under 45 years old at bedrest for less than a week before death. Evidence also was obtained that thrombogenesis may continue for weeks.

Search terms: Embolism /Injuries; Thrombosis /Injuries; Thrombosis; Thrombosis /Age factors; Embolism /Lungs

AVAILABILITY: In HS-800 431

**HS-800 449 Fld. 1/2****IMPACT HEAD INJURY:  
MECHANISMS AND PREVENTION**

by E. S. Gurdjian; V. R. Hodgson; L. M. Thomas; L. M. Patrick

Wayne State Univ., Detroit, Mich.  
WQ9600

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p140-3

Presented at an international meeting held in Washington, D. C., 6-9 Jun 1968.

The following types of head injuries and the mechanism by which the injury is inflicted are described: tearing of scalp; deformation of skull with or without fracture; pressure and movement of intracranial contents; depressed skull fracture; brain tissue damage. The following principles of protection are set forth: methods of distributing force over large areas; absorption of energy; and prevention of contact of the body with the other object. Protective devices may be worn to reduce effective acceleration and energy or may be incorporated into vehicles to attenuate acceleration and distribute the energy of collisions.

Search terms: Scalp injuries; Brain injuries; Head injuries; Injury prevention; Skull fractures

AVAILABILITY: In HS-800 431

**HS-800 450 Fld. 1/2****THE POSTMORTEM EXAMINATION  
OF BRAIN INJURIES**

By Richard Kindenberg

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p144-53

114 refs

Presented at an international

conference held in Washington, D. C., 6-8 Jun 1968.

How the pathologist should proceed in examining the brain in cases of mechanical injury is presented. One important prerequisite for proper evaluation of brain lesions is a careful description of all extracranial traumatic and nontraumatic alterations, because the brain may reveal lesions which may or may not be related to the trauma. The main categories of lesions to be encountered are: primary traumatic lesions; secondary circulatory lesions; indirect circulatory lesions; operative lesions; and lesions of natural cause. The site and size of external and subcutaneous alterations, of skull fractures, and of operative lesions should be indicated on diagrams. They render immediate and most reliable information when the brain is studied after fixation. Instructions for writing the brain note are included.

Search terms: Autopsies /Head injuries; Head injuries /Medical case reports; Autopsies /Recording

AVAILABILITY: In HS-800 431

**HS-800 451 Fld. 1/2****THE PATHOLOGY OF FATAL  
CRANIOSPINAL INJURIES**

by Henry H. Bohlman; Donald D. Davis

Johns Hopkins Hospital, Baltimore, Md., J03000

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p154-9

15 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

This investigation was designed to study craniospinal pathology of victims of fatal accidents. Of the 35 subjects, 17 were drivers of vehicles

and nine were pedestrians. Tables of distribution of lesions are provided. There was a high correlation between the occurrence of neck and head injuries so that there should be a high index of suspicion of neck involvement in any person subjected to head trauma; the reverse is true. This survey suggests that the head and neck are an anatomic and physiology unit, and as such suffer pathology together.

Search terms: Driver fatalities; Pedestrian fatalities; Head injuries /Pathology; Spinal injuries /Pathology

AVAILABILITY: In HS-800 431

**HS-800 452 Fld. 1/2****PATHOLOGIC BIOMECHANICS OF  
CENTRAL-NERVOUS-SYSTEM  
INJURY IN HEAD IMPACT AND  
WHIPLASH TRAUMA**

by Ayub K. Ommaya; Paul Corrao

National Institute of Neurological Diseases and Blindness, Bethesda, Md., N21600

Published in *Accident Pathology. Proceedings of an International Conference*, 968 p160-81

52 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

A review of the biomechanics of experimental central-nervous system trauma and an attempted correlation with available physiologic and pathologic data is presented. Experimental methods for whiplash and impact tests using the rhesus monkey primarily are described. In the study reported in detail, occipital blows were studied primarily. Impact velocity and kinetic energy were significantly related to the production of concussion as were the linear acceleration of the head and the impulse of the blow in a statistical

**NHTSA Accident Investigation Report (Cont'd.)**

**HS-800 452 (Cont'd.)**

study of the physical data from 30 monkeys. The data from the initial analysis were compared with results obtained after impact experiments in 17 animals wearing a cervical collar. A most crucial finding emerged - namely, that much greater energy of impact could be sustained. This result was attributed to the restriction of angulation of the head on the neck. Data obtained specifically for testing Holbourn's theory are examined.

**Search terms:** Brain injuries /Pathology; Spinal cord injuries /Pathology; Whiplash injuries /Monkeys; Impact tests /Monkeys; Cervical spine impact tolerances; Impact velocity /Brain concussion; Head impact tolerances /Physiology; Restraint systems /Neck; Brain concussion /Respiration; Brain concussion /Electroencephalography; Brain concussion /Electrocardiograms; Brain concussion /Blood pressure; Brain concussion /Cerebrospinal pressure

**AVAILABILITY:** In HS-800 431

**HS-800 453 Fld. 1/2**

**THE NATURE, CAUSES, AND PREVENTION OF NECK INJURIES IN CAR OCCUPANTS**

by William Gissane

Birmingham Accident Hospital and Rehabilitation Center, Warwick (England), B15400

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p182-9

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

The more serious neck injuries reported in this paper are from a detailed analysis of 315 car occupant fatalities, or a fair sample of the more severe crashes on English roads from 1961 through 1963. The autopsy records included 39 serious neck injuries; 35 were fractures or fracture dislocations of which four were associated with transection of the cord, and the remaining four were most frequently described by the pathologist as "fracture of the larynx". Of the 39 victims, 18 were drivers, 18 were front seat passengers, and three were rear seat passengers. One victim, wearing a single diagonal seat belt, was ejected, but his neck caught in the belt, which resulted in a fracture dislocation of the first cervical vertebra on the second. A complete transection of the cord resulted. Only one rearend collision occurred in this fatality study. Vehicle design also is discussed.

**Search terms:** Driver fatalities; Passenger fatalities; Front seat passengers /Fatalities; Rear seat passengers /Fatalities; Injury research; Neck injuries; Spinal cord injuries; Larynx injuries; Seat belts /Spinal cord injuries; Seat belt caused injuries; Safety design /Injury prevention

**AVAILABILITY:** In HS-800 431

**HS-800 454 Fld. 1/2**

**EXPERIMENTAL PRODUCTION OF ACCELERATION INJURIES OF THE HEAD AND NECK**

by Jack K. Wickstrom; Raoul P. Rodriguez, Jr.; John L. Martinez

Tulane Univ., New Orleans, La., T41400

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p185-9

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

On interim report on 86 primates that

have been exposed to acceleration forces of various degrees and durations and a review of the pathology is presented. Conclusions include: about 75% of small primates subjected to forces that produce head velocity changes about 33 ft/sec will sustain injury; the brains of larger primates with heavier necks are protected better, but those animals sustain neck injuries at lower velocity changes. Complete restraints that prevent angular acceleration will protect against brain and neck damage. EEG studies are important in detecting abnormal functions after injury.

**Search terms:** Acceleration injuries /Primates; Head injuries /Acceleration tests; Brain injuries /Acceleration tests; Neck injuries /Acceleration tests; Acceleration injuries /Electroencephalography; Restraint system effectiveness /Acceleration tests

**AVAILABILITY:** In HS-800 431

**HS-800 455 Fld. 1/2**

**AUTOMOBILE ACCIDENTS RESULTING FROM THE DRIVER'S CARDIOVASCULAR DISEASE: A CHALLENGE TO ACCIDENT INVESTIGATION**

by Charles S. Petty

Indiana Univ. Medical Center  
Indianapolis, I24000

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p192-5

20 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Two cases are presented to illustrate the problems of crash investigation and the relationship of cardiovascular disease to the crash cause.

**Search terms:** Accident causes /Cardiovascular diseases;

Medical case reports; Accident investigation /Autopsies

AVAILABILITY: In HS-800 431

**HS-800 456 Fld. 1/2**

**NONPENETRATING INJURIES OF THE ABDOMEN IN LANDCRAFT ACCIDENTS**

by Willys F. Mueller

Armed Forces Inst. of Pathology, Washington, D. C., A59400

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p196-203

80 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

The autopsy protocols of victims of fatal motor-vehicle accidents in the files of the Armed Forces Institute of Pathology are reviewed. The incidence of trauma to the abdomen and to individual abdominal organs is reported. The vehicles were divided into four wheel and two wheel for the purposes of this study. In addition incidence of injuries to other areas is reported. The incidence of abdominal trauma was almost equal for vehicles of both sizes. Hepatic injuries were most frequent. Next highest percentages of injuries were to kidney, spleen, and pelvis.

Search terms: Autopsies /Research methods; Vehicle size /Injury statistics; Vehicles /Injury statistics; Abdominal injuries /Reviews; Liver injuries /Statistics; Pancreatic injuries /Statistics; Genital injuries /Statistics; Stomach injuries /Statistics; Motorcycle accidents /Injury statistics; Vehicle accidents /Injury statistics; Kidney injuries /Statistics; Splenic injuries /Statistics; Pelvic injuries /Statistics; Aortic injuries /Statistics; Visceral injuries /Statistics

**HS-800 457 Fld. 1/2**

**PATHOLOGY OF OBSTETRIC INJURIES IN PREGNANT AUTOMOBILE-ACCIDENT VICTIMS**

by Warren M. Crosby

Oklahoma Univ., Oklahoma City. School of Medicine, 012000

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p204-7

10 refs

Presented at an international conference held in Washington, D.C., 6-8 Jun 1968.

Injuries sustained by pregnant victims of automobile accidents are reviewed. When the pregnant victim was not restrained, the pattern of injury was one of skeletal and pelvic fractures with or without internal injuries. When the mother was restrained, the pattern of injury was characterized by isolated single injuries to the head, limbs, or abdominal organs. Fetal death was associated with uterine rupture, placental separation, maternal shock and fetal head injury, but the leading cause of fetal death was maternal death. Abortion occurred in 20% of the cases in which the length of gestation was 20 weeks or less.

Search terms: Pregnancy /Automobile accidents; Pregnancy /Injury statistics; Abortion /Injury statistics; Fetal death /Injury statistics; Fetal injuries /Automobile accidents; Uterine injuries /Automobile accidents; Pregnancy /Fatalities

AVAILABILITY: In HS-800 431

**HS-800 458 Fld. 1/2**

**A PANEL DISCUSSION**

by Thomas D. Kinney; Milton

Published in *Accident Pathology. Proceedings of an International Conference*, 1968 p210-13

Presented at an international conference held in Washington, D. C., 6-8 Jun 1968.

A panel discussion on forensic autopsy and pathology is presented.

Search terms: Forensic medicine; Autopsies

AVAILABILITY: In HS-800 431



# executive summary

## A SYNOPSIS OF A RECENTLY RELEASED NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION RESEARCH REPORT

### PROJECT DRIVER

The principal objectives of contract FH-11-7126 were to conduct a study to:

- Demonstrate the feasibility of increasing driver knowledge through immediate feed-back of information to the driver license applicant by utilizing projection equipment during the examination process to: (a) Display a traffic problem, (b) display the examination question, and (c) display the correct answer to the traffic problem.
- Develop an experimental design, to include experimental and control groups, with provisions for evaluation of: (a) Applicant's retention ability when tested under manual procedures and the DRIVER program procedures, (b) applicant's subsequent driving performance during the driving test and after licensing when tested under both procedures, and (c) the percentage of applicants who pass when tested under both procedures on the first and subsequent trials.
- Document and analyze both examination procedures, manual and DRIVER, in terms of cost versus effectiveness of applicants tested.

Contract FH-11-7126  
Jointly by  
Department of Public Safety,  
State of Oklahoma

The University of Oklahoma  
Research Institute  
Norman, Oklahoma  
DOT/HS-800 304 PB-195-133

Award Amount: \$70,000.00  
Date Report Due: 8/31/70  
Date Report Rec'd: 10/30/70  
Date Released: 11/2/70

### BACKGROUND

The problem of highway safety is being attacked on many fronts today. Many persons who work in the field point out the critical importance of driver training and driver licensing. The study, synopsized here, is

concerned with one phase of driver licensing, the testing of applicants using a new method.

It has been recognized that many forces operate to reduce the effectiveness of licensing

programs in the various states. These include lax licensing laws, overworked licensing personnel, inadequate training and equipment for licensing personnel, absence of effective retesting programs for previously licensed drivers, and many others. Some of these problems have been overcome through the dedication of licensing personnel in the various states. However, improved procedures are sorely needed in many states.

The Demonstration Project investigation was conducted to evaluate the effectiveness of one new method proposed for improving the pre-drive testing procedures used during driver licensing. A description of the purposes for conducting the research, the experimental methods used, and the results obtained are detailed in the report.

Consideration should be given to some of the aspects of the overall licensing problem as related to highway safety, since the ultimate purpose of the project is the improvement of highway safety. Testing of drivers has traditionally consisted of three principal aspects:

1. Physical capabilities such as vision, audition, limb movements, etc.
2. Factual knowledge related to driving and driver responsibility.
3. Actual demonstration of driving performance.

The critical question is obviously how each of these aspects relate to safe driving performance over a given period of time. Do drivers have accidents because their vision is less than the level tested, because they forget factual knowledge tested, or for some other reason related to the testing procedure? The ultimate question becomes one of testing so effectively that only drivers who are good risks receive a license. The purpose of the research is directed toward achievement of that goal.

## SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A study of the effectiveness of a new method of testing driver's license applicants was performed. The equipment utilized two projectors to display a traffic scene and an associate question. The scoring was performed by choosing one of four responses and pressing a button at the subject's chair. Immediate feedback of the correct response was displayed below the projection screen.

The traffic scenes and corresponding questions were developed for use with the equipment as a part of the contract effort.

An evaluation was performed to determine the effectiveness of this new method of giving driving tests on the following parameters:

1. Relationship of machine test score to subsequent driving test score.
2. The retention of information tested with the new machine testing procedure.
3. The relationship of test score to subsequent driving record.
4. The cost effectiveness of the new machine testing procedure.

Control groups were employed to compare the machine testing procedure with written testing procedure.

Within the controls and limitations of the present study as discussed in the text, the following conclusions can be stated:

1. No significant correlation exists between either written test score or machine test score and drive test score.
2. No significant difference in retention of test information was found when comparing the written and machine test procedures.

3. Relationships between written or machine test procedures and subsequent driving record are inconclusive due to the small sample obtained within the time period available. There is a suggestion that the machine test group had fewer problems within the category of negligent driving habits.
4. The new machine testing procedure as presently employed offers no significant reductions in the cost of giving driving tests.
5. The subjective opinions of subjects taking the new machine test are heavily in favor of the machine test.

Perhaps the greatest strength of the new machine testing procedure was identified by many persons taking the test in the statement that "It was a more *professional* test." The novelty of such a new experience would account for some of this enthusiasm, but even more important is the idea that it avoids the direct confrontation with someone who is not always viewed as objective, despite the training received by the examiners.

The conclusion is inescapable after performing the present study that two factors were not weighted heavily enough in planning and conducting the present study. These factors are the software used on the machine and time period for conducting the study.

The costs for software were approximately 1/7 of the cost for hardware. In the final conclusion, the Automated Driver Improvement and Testing (ADIT) machine will perform no better than the software provided. Surveys of the software available after starting the research leads to the conclusion that much more needs to be known about all aspects of its development and use, particularly in test composition. The criterion used for construction of a test is supposedly to screen out poor drivers and

keep them from the road. Yet very little has been done to show whether this is possible and how it can be accomplished. It is hoped that the development of a national item bank for test construction, currently being developed under an NHTSA contract, will address this problem, rather than just compiling an extensive list of unproven questions.

It is the author's opinion that performing an adequate study of the problem of testing and its relation to driving record would require a controlled study over a 3-4 year period, exploring the use of slides, video-tape and motion pictures, while following driving records for this extended period.

The Department of Public Safety, State of Oklahoma, does not plan to install additional ADIT units because of a utilization problem. Installation is under way of individual testing stations in trailers for two additional locations. These installations will employ the same principle of machine testing, but with individual units linked to a central console.

The Contract Manager has certified that the contractor's work has been satisfactorily completed and that all contractual obligations have been met.

The opinions, findings, and conclusions expressed in this summary are those of the Contractor and not necessarily those of NHTSA.

**Availability:** This report may be ordered in paper copy (PC) or microfiche (MF) from NTIS. Order by DOT/HS-800 304 or PB-195 133.



# U.S. DEPARTMENT OF TRANSPORTATION

## NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

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V	Regional Administrator, NHTSA, 18209 Dixie Highway, Homewood, Illinois 60430. Tel: 312-779-6500. (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin)
VI	Regional Administrator, NHTSA, 819 Taylor Street, Room 8442, Fort Worth, Texas 76102. Tel: 817-334-2021. (Arkansas, Louisiana, New Mexico, Oklahoma, and Texas)
VII	Regional Administrator, NHTSA, P.O. Box 7186, COUNTRY CLUB Station, Kansas City, Missouri 64113. Tel: 816-361-7887. (Iowa, Kansas, Missouri, and Nebraska)
VIII	Regional Administrator, NHTSA, Room 107, Bldg. 40, Denver Federal Center, Denver, Colorado 80225. Tel: 303-233-6479. (Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming)
IX	Regional Administrator, NHTSA, 450 Golden Gate Avenue, Box 36096, San Francisco, California 94102. Tel: 415-556-5450. (Arizona, California, Hawaii, and Nevada)
X	Regional Administrator, NHTSA, Room 301, Mohawk Bldg., 222 S.W. Morrison Street, Portland, Oregon 97204. Tel: 503-226-3754. (Alaska, Idaho, Oregon, and Washington)

